DELHI AVIATION FUEL FACILITY PRIVATE LIMITED
AVIATION FUELLING STATION
SHAHBHAD MOHAMMADPUR
IGI AIRPORT
NEW DELHI-110061

TENDER NO: DAFFPL/MOD/FF/2018-19/06

INVITING TENDER FOR CONSTRUCTION OF SEWERAGE SYSTEM

BID DUE DATE & TIME: 1500 Hrs. IST on 20th October 2018

OPENING OF TECHNICAL BIDS: 1200 Hrs. IST on 22nd October 2018

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Sign & Stamp of Bidder

Contents

NOTE: BIDDERS ARE REQUESTED TO SIGN AND STAMP ALL THE PAGES OF THE TENDER DOCUMENT AND SEND THE SAME BACK IN THEIR OFFER AS A TOKEN OF UNCONDITIONAL ACCEPTANCE OF TENDER FIRMS.

THE DEVIATIONS, IF ANY, SHOULD BE MENTIONED SEPARATELY ON BIDDER‟S LETTER HEAD IN TECHNICAL BID. THE DEVIATIONS MENTIONED ANYWHERE ELSE SHALL NOT BE CONSIDERED. IN ABSENCE OF DEVIATION SHEET, IT WOULD BE CONCLUDED THAT BIDDER HAS ACCEPTED THE TENDER TERMS WITHOUT ANY DEVIATIONS. CORRECTIONS IN TENDER DOCUMENT WILL NOT BE ACCEPTED.

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Sign & Stamp of Bidder

DELHI AVIATION FUEL FACILITY PRIVATE LIMITED

TENDER NOTICE
DELHI AVIATION FUEL FACILITY PRIVATE LIMITED

INVITING TENDER FOR CONSTRUCTION OF SEWERAGE SYSTEM AS PER SPECIFICATIONS AS REQUIRED

TENDER NO: DAFFPL/MOD/FF/2018-19/06

Delhi Aviation Fuel Facility (P) Ltd (DAFFPL) invites sealed bids under single stage two bid system from eligible bidders for construction of sewerage system.

Brief Scope of work:

We intend to construct sewerage system as per specification as required. Scope includes supply of material and construction of septic tank & collection pit with pumping system and laying of sewer line, connecting to DIAL's STP along with associated electrical works at our DAFFPL facility.

Bid Security (EMD):	As mentioned in the Tender document
Date, Time & Venue for Voluntary Pre-bid Meeting:	12th October 2018; 1100 HRS (IST) at DAFFPL, Aviation Fuelling Station, Shahabad Mohammadpur, New Delhi-110061
Bid Due Date, Time & Place of Submission:	Upto 15:00 HRS (IST) on 20th October 2018 at the office of the Chief Executive Officer, DAFFPL, Aviation Fuelling Station, Shahabad Mohammadpur,

Detailed Invitation for Bids (IFB) along with Pre-qualification Criteria, Bid Document Corrigenda can be viewed and downloaded from DAFFPL's website: **http://www.daffpl.in**

Chief Executive Officer
DAFFPL, New Delhi
9810081078

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CHAPTER 1: INTRODUCTION (COVERING NOTE)

Delhi Aviation Fuel Facility Private Limited (DAFFPL) is a Joint Venture comprising Indian Oil Corporation Ltd. (IOCL), Bharat Petroleum Corporation Ltd. (BPCL), and Delhi International Airport (P.) Ltd. (DIAL). We provide the infrastructure aimed at ensuring an uninterrupted flow of Aviation Turbine Fuel (ATF) to all type of aircrafts at the Indira Gandhi International Airport, New Delhi (IGI Airport) as per international benchmarking.

The bidder/ contractor shall refer to various sections of this tender document for detailed scope of work. It is contractor's responsibility to execute the job in all respects as per detailed drawings, documents / specification furnished by consultant / owner and as per applicable codes, standards & in line of statutory requirements.

The field circumstances shall also be taken into consideration and methods suitable to the site conditions shall be adopted with concurrence of the Engineer-in-charge and in line with manuals, instructions of respective equipment and specified codes and standards. The successful accomplishment of the project is greatly influenced by the team work, workmanship of the workers and supervisors.

The Contractor shall employ only such workers and supervisors who have considerable experience of similar work and who can work, temperamentally in good harmony and co-operation.

Delhi Aviation Fuel Facility Private Limited (DAFFPL) invites sealed tenders in prescribed tender form under two-bid system. For viewing details including EMD, BID QUALIFICATION CRITERIA etc. please visit our web site www.daffpl.in and go to tender section by clicking the link "Tenders". Tender documents are available on our website.

The bid documents can also be collected from our office and the bids are to be submitted in Physical form in the Tender Box kept at the office of the **Delhi Aviation Fuel Facility Private Limited (DAFFPL)** at Shahabad Mohammadpur, New Delhi-110061, India.

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1. The Tender is floated in Two Bid system consisting of Technical Bids (Bid Qualification Criteria - BQC, Technical plus Commercial) and Price Bids.

   Part-I : Bid Security / EMD in accordance with tender document.
   Part-II : BQC (Bid qualification criteria), Technical & commercial Bid, duly filled in & along with all supporting as requested to be submitted in Physical form in the Tender Box.
   Part –III : Price Bid.

2. The bidder should be able to construct the entire size/type/quantity bidded by them. Bidders cannot bid for part items or part quantity.

3. Firstly, the Technical bid (BQC & Techno commercial bids) shall be opened. The Bids shall be initially scrutinized by a team as per tender requirements of BQC (Bid qualification criteria). Technical cum commercial bids of only those vendors who qualify the BQC will be processed further. The price bids of only techno-commercially qualified bidders will be opened, evaluated and shortlisted for Placement of Work Order.

4. Each page of bid documents is to be duly signed & stamped by the bidder before submitting the Tender.

5. The bids submitted should be valid for **four months** from the due date of bid submission for Owners acceptance. Once accepted it will remain firm till completion of contracts/orders.

6. We request the bidder to carefully go through all tender documents before submitting the offer. Please note that any exceptions or deviations to the tender document are necessarily to be recorded in the attached deviation statement only. Any exceptions/deviations brought out elsewhere in the bid shall not be considered.

7. The bidders may be invited for a presentation to DAFFPL during Techno-commercial evaluation before price bid opening.

8. The bidders to provide their bank details/ PAN / Sales Tax /WCT Registration numbers/Goods & Service Tax Registration No. / VAT registration No., as applicable for updating vendor master file. You are also requested to keep us informed of any change in address / status of your business / contact details including email address etc.

9. Party can quote with the deviations as referred in Point No.6 above. Please refer query end date / time in tender calendar after which no query posted by bidder

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shall be considered. However, DAFFPL reserves the right to respond the queries after cutoff date / time mentioned in tender calendar.

10. Please note that queries related to scope of job, tender specifications, terms & conditions etc., should be submitted by means of letter/E mail to reach the owner's office not later than one week before the meeting. It may not be practicable to answer queries received late, but queries and responses/clarifications will be posted in the form letter, E-mail within one week from the date of Pre Bid Meeting. Any modification in the bid document that may become necessary as a result of the Pre-Bid meeting shall be made by the owner exclusively through the issues of corrigendum/ addendum posted at web site and not through the minutes of the pre-bid meeting.

11. UNSOLICITED POST BID MODIFICATION
    Bidders are advised to quote strictly as per terms and conditions of the Bidding Document. After tender submission due date & time/ extended due date & time (as the case may be) the bidders shall not make any subsequent price changes, whether resulting or arising out of any technical / commercial clarifications sought/allowed on any deviations or exceptions mentioned in the bid unless discussed and agreed by DAFFPL in writing.

12. EMD & Techno Commercial bid shall be opened on **22nd October 2018 at 12:00 Hrs (IST)** in the presence of authorized representative of bidders (Restricted to one [1] person per bidder only) at the office of DAFFPL. Price Bid of only those bidders whose offer is found meeting both BQC & techno-commercially acceptable, shall be opened on a later date as per convenience of DAFFPL after intimation to the qualified bidders.

13. DAFFPL reserves the right to accept any tender in whole or in part or reject any or all tenders without assigning any reason. DAFFPL reserves right to accept any or more tenders in part. Decision of DAFFPL in this regard shall be final and binding on the bidder.

    QUERIES AND CLARIFICATIONS: Any query or clarification with regard to this tender may please be referred to below address & phone nos. on any working day during office working hours

Mr Manish Kumar Project Officer manish.kumar@daffpl.in, vishnu.vardhan@daffpl.in, 9810640818, 8826000228	Mr. Kumar Amitabh (Consultant) Project Manager saga.amitabh@gmail.com 7738382997

14. GOVERNING LAWS: The laws of Union of India shall govern all matters concerning the tender. Any issue arising related to the tender or the selection process shall be adjudged by the courts in Delhi alone.

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15. A Pre-bid meeting is scheduled for **12th October 2018 at 1100 Hrs IST** at the office of DAFFPL, New Delhi. All prospective bidders can participate in the same. Any clarification with regard to tender shall be sorted out during the pre-bid meeting.
    a. The purpose of the pre-bid meeting is to clarify any doubts of the BIDDER on the interpretation of the provisions of tender.
    b. Bidder(s) are requested to submit their queries, mentioning form name, clause no. & clause, by a letter / e-mail to our office as per schedule in order to have fruitful discussions during the meeting.
    c. All the Bidder(s) are requested to attend the pre-bid meeting to be held at DAFFPL Office as per schedule.

16. **Tender document can be purchased from our office located at Shahabad Mohammadpur at a cost of Rs 1000/- and also can be downloaded from our website www.daffpl.in.**
    - **A bidder who downloads the document from website has to submit a separate DD for an amount of Rs.1000/- along with the EMD document.**
    - **Bidders who purchase the document from our office have to submit a DD for an amount of Rs.1000/- at the time of purchase.**

17. **Earnest Money Deposit (EMD) (also referred to as Bid Security):** Bidder shall be required to submit the Earnest Money Deposit (EMD), either in the form of Bank guarantee as per format (provided as Annexure) or PAY ORDER or BANK DRAFT (in favour of Delhi Aviation Fuel Facility Private Limited, payable at New Delhi) at our office. The EMD in either form has to be submitted on or before the due date & due time of bid submission of this tender with a covering note mentioning the tender no.

    a. The bidders not submitting EMD by due time & date shall be rejected & their bids shall not be evaluated further.
    b. **The EMD amount shall be 1.0 Lakhs INR**
    c. Firms registered with National Small Scale Industries (NSIC)/MSME of India are exempted from submission of bid security. Central Public Sector Enterprises of India and Firms registered with Nation Small Scale Industries Corporation (NSIC) of India are exempted from submission of Bid Security. Central Public Sector Enterprises are requested to give a self-declaration on their letter head to this effect. Bidders registered with NSIC of India are also requested to submit self-declaration on their letter head to this effect along with a copy of their Valid Registration certificate, specifying limit of volume and other details which should be submitted.

18. **Site Restriction:** The job must be done in an area which is inside & around/outside the premises of DAFFPL Fuel Facility. Successful bidder will have to follow all the

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security norms and procedures for entry and exit to the facility. The job timings will have to change as per the permissions obtained from Operation Dept. All the entry procedures for labours / machinery / raw materials as per the rules of the DAFFPL will have to be followed by the vendor. Contractor shall visit the site and ensure familiarity with the working condition / limitations at the site. Also, the entire works are to be carried out in an operating Location. The contractor may have to follow the timings of the facility and must work under restricted conditions. The normal working hours of facility is 0930 Hrs to 1800 Hrs on Monday to Saturday except holidays. Working beyond above normal working hours /holidays /Sundays are to be with prior permission of Engineer in charge and relevant facility officers. Contractor is required to plan his work within the normal working hours and days and accordingly he has to mobilize the resources to complete the job within the scheduled time. However, all efforts will be made by DAFFPL to give extended working time beyond normal working time in order to help the contractor for early completion of the job. No additional payment / charges shall be payable for such works. Not getting permission for working on holidays/ Sundays or beyond normal working hours will not be considered as reason for delay in work. The contractor and his personnel have to obey all rules and regulations of the plant. Trained and experienced supervisor/ engineer are required to be present at the work spot always.

All hot work like welding, cutting, grinding etc. needs to be done in the closed booth of asbestos cloth. No extra claim on account of the same will be considered. Also the shutdown jobs may get delayed due to operational requirement. Any extra claims on account of the same will not be entertained.

The tenderer must visit the site of the tender and familiarize himself with location, operating / working conditions as well as any other local factors which could influence the working before quoting for the job. His quote should take care of any such restrictions; conditions etc and any claim afterwards will not be entertained. **It is suggested that the Tenderer must visit the site in order to have a better idea of site conditions and factors.**

19. **Completion Time:** Time is the essence of the contract. The time period of contract is 03 **(Three) months** from the date of Letter of Intent including monsoon period. **The time includes necessary time required for mobilizations and demobilizations after the execution of work and includes monsoon period.** Successful bidder is required to provide a bar chart /schedule showing the activities/events with time along with the Technical bid to be scheduled accordingly.

20. The work is required to be done in a working/operating location, the party has to get necessary Hot/cold work permits from the concerned officer in plant as per OISD standards and all workmen should be provided with necessary safety helmet, safety

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belts, safety shoes and other standard safety equipment's. Any delay on account of non-adherence to safety norms, rules and regulations of plant as well as obtaining work permits from the plant shall not be accounted for the delay in completion of job.

21. **Receipt & storage of material at Site**: Contractor is required to make his own arrangement for unloading and storage of materials at site. Contractor is required to inform us prior to dispatch of materials and his representative required to be available for receipt and unloading of materials at site.

22. The successful vendor has to arrange and submit to fuel facility the proper **POLICE VERIFICATION DOCUMENTS** (if required) of all the labours, site in charges, supervisors, welders, grinders and all associated workmen who will be coming inside the terminal for carrying out related jobs.

23. For carrying out the jobs inside the depot the vendor must arrange for associated tools, tackles, manpower, machinery of his own and no extra payment will be made to vendor on account of the same.

24. For arranging the electricity vendor to note that only Acoustic Proof, box type DG sets will be allowed inside the depot premises. Vendor to also note that proper GI plate type earthing system as per IS 3042 (LATEST) has to be provided by the vendor for DG set and no extra payment will be done for the same. There should be two nos. earthing system connected in a grid at a location as instructed by DAFFPL site in-charge

25. All the debris, scrap, cut pieces, etc coming out of fabricated plates, excavated earth, area cleaning will have to be shifted by the vendor to a location inside or outside the terminal premises as per the instruction of DAFFPL site in-charge and no extra payment will be done for the same.

THE FORMS /ATTACHMENTS TO THIS TENDER ARE AS UNDER:

1. Covering Note – CHAPTER: 1
2. Instructions To Bidders - CHAPTER: 2
3. Bid-Qualification Criteria - CHAPTER: 3
4. Performance of Work – CHAPTER: 4
5. General Purchase Conditions- CHAPTER: 5
6. Technical Specification Documents - **(Attached separately as Annexure I)**
7. Annexure attached are as follows:

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- Annexure II – DEVIATION SHEET
- Annexure III – DECLARATION SHEET
- Annexure IV – FORMAT FOR DRAFT BANK GUARANTEE IN LIEU OF BID SECURITY (EMD)
- Annexure V - FORMAT DRAFT COMPOSITE BANK GUARANTEE FOR SECURITY DEPOSIT/PERFORMANCE GUARANTEE
- Annexure VI – FORM OF LETTER OF UNDERTAKING
- Annexure VII – DECLARATION TO BE SUBMITTED ALONGWITH Technical BID
- Price Bid

Thanking you,
Yours faithfully,
For DELHI AVIATION FUEL FACILITY (P) LTD.

Chief Executive Officer
DAFFPL, New Delhi

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CHAPTER 2: INSTRUCTIONS TO BIDDERS

1. The bidder shall bear all costs associated with the preparation and submission of the bid and Owner will in no case be responsible or liable for these costs, regardless of the conduct or outcome of the bidding process.

2. Vendor is requested to submit their bids taking full notice of all the technical specifications, terms and conditions, forms & attachments to this tender. Bids must be submitted in Physical form only.

3. Owner reserves the right to accept / reject any or all bid qualification documents at their sole discretion without assigning any reason whatsoever.

4. Owner is not responsible for any delays from bidder end.

5. Owner reserves the right to make any changes in terms and conditions of purchase before due date of bid submission and to reject any or all bids received incomplete.

6. Undertaking by the bidder:
    a. I/we hereby undertake that the statements made herein/information given in the bids through Physical Tendering system/annexure/forms referred are true in all respects and that in the event of any such statement or information being found to be incorrect in any particular, the same may be construed to be a misrepresentation entitling DAFFPL to avoid any resultant contract.
    b. I/we further undertake as and when called upon by DAFFPL to produce, for its inspection, original(s) of the document(s) of which copies have been annexed hereto.

7. Owner, at its discretion reserves the right to verify information submitted by the bidders.

8. Bidder to submit documents/information to satisfy the bid qualification criteria. Bidders should also be in a position to produce further information as and when required by DAFFPL with in a time limit of 15 days.

9. DAFFPL reserves their right to negotiate the quoted prices with lowest bidder.

10. Bidders would be qualified based on data and documents submitted by them.

11. Owner's decision on any matter regarding short listing of vendors shall be final and no corresponding in this regards will be entertained.

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12. The vendors who are on IOCL/BPCL/DIAL holiday list or delisted will not be considered.

13. The bidder is expected to examine all instructions, forms, attachments, terms and specifications in the tender document. The entire tender document together with all its attachments thereto, shall be considered to be read, understood and accepted by the bidder, unless deviations are specifically stated seriatim by the bidder. Failure to furnish all information required in the tender document or submission of a bid not substantially responsive to the tender documents in every respect will be at bidder risk and may result in the rejection of his bid. The bidder scope of supplies as specified in the material requisition shall be in strict compliance with the scope detailed therein and in the bid document.

14. Bidders in their own interest shall ensure that they submit their bid, complete in all respects, well within the specified bid due date and time. No relaxation shall be given for delay due to any unforeseen event in submission of bid.

15. At any time prior to the bid due date, we may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder, modify the bid document. The amendment will be notified through our portal www.daffpl.in to all prospective bidders and will be binding on them. In order to afford prospective bidder, reasonable time in which to take the amendment into account in preparing their bids, we may, at our discretion, extend the bid due date.

16. The bid prepared by the bidder and all correspondence/ drawings and documents relating to the bid exchanged by bidder and the owner shall be written in ENGLISH language, provided that any printed literature furnished by the bidder may be written in another language so long as accompanied by an ENGLISH translation, in which case, for the purpose of interpretation of the bid, the ENGLISH translation shall govern.

17. Declaration with the bid qualification criteria that bidder has not been banned or delisted by any Government or quasi Government agencies or Public Sector Undertaking (PSU) as per declaration format (provided as annexure) of the tender document should be submitted along with the bid.

18. Bidders are advised to submit bids based strictly on the terms & conditions and specifications contained in the tender document and not to stipulate any deviations. Each Bidder shall submit only one bid. A Bidder who submits more than one bid will be rejected. Alternative bids will not be accepted.

19. The Owner may, at its discretion, extend the bid due date, in which case all rights and obligations of the Owner and the Bidders, previously subject to the bid due

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date, shall thereafter be subject to the new bid due date as extended. The same will be hosted in the web site.

20. Bids shall be kept valid for 4 months from the bid due date. A bid valid for a shorter period shall be considered as non-responsive and rejected by the Owner. Notwithstanding above, the Owner may solicit the Bidder consent to an extension of the period of bid validity. The request and the responses thereto shall be made in writing. The EMD (bid security) shall also be accordingly extended.

21. Telex/ Telegraphic/ Telefax / E-mail offers will not be considered and shall be rejected.

22. No bid shall be modified subsequent to the due date & time or extension, if any, for submission of bids. Bidder(s) to note that Price changes after submission of bid shall not be allowed. In case any bidder gives revised prices/price implication, his bid shall be rejected. No bid shall be allowed to be withdrawn in the interval between the deadline for submission of bids and the expiration of the period of bid validity specified by the Bidder. Withdrawal of a bid during this interval shall result in the forfeiture of Bidder s EMD.

23. Bids that do not meet the Bid qualification criteria as specified in the bid document shall be rejected. A bid with incomplete scope of work and/or which does not meet the technical requirements as specified in the bid document, shall be considered as non-responsive and rejected. Conditional bids will be liable for rejection.

24. The Owner will examine the bids to determine whether they are complete, whether any computational errors have been made, whether the documents have been properly signed and whether the bids are generally in order.

25. The bids without requisite EMD and/or not in the prescribed Performa and the time limit will not be considered and bids of such bidder(s) shall be rejected.

26. PRICE EVALUATION CRITERIA: As award is on overall landed lowest basis, part offers will be rejected. Bidder has to quote for all items in a lot for us to consider them.

27. Prior to the expiration of period of bid validity, the owner will notify the successful bidder in writing or by e-mail, that his bid has been accepted. The Notification of Award will constitute the formation of the Contract. Delivery Period shall be counted from the date of notification of award (Letter/Fax/e-mail of Intent).

28. Any efforts by a bidder to influence the owner/ in the owner bid evaluation, bid comparison or contract award decisions may result in the rejection of their bid.

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29. ISSUE OF CONTRACT/ PURCHASE ORDER: After the successful bidder has been notified that his bid has been accepted, DAFFPL will send to such bidder a detailed contract/purchase order incorporating all the terms and conditions agreed between the parties. Within 15 days of receipt of the detailed order, the bidder shall sign and return to the owner the duplicate copy of the order as a token of their acknowledgement.

30. Vigil Mechanism: DAFFPL has developed the Vigil Mechanism to deal with references/ grievances, if any, that is received from bidders who participated / intends to participate in the tender. The details of the same are available on our website www.daffpl.in

31. VERIFICATION BY OWNER: All statements submitted by bidder regarding experience, manpower availability, equipment and machinery availability etc., are subject to verification by the owner either before placement of order or after placement of order. If any data submitted by the bidder at the bid stage is found to be incorrect, the offer is liable to be rejected or the contract/order is liable to be terminated.

32. SEALING & MARKING OF BIDS

A. Bids shall be submitted separately in THREE SECTIONS in sealed envelopes superscribed with the Bid Document number, bid due date and time, item and nature of bid as under:

- **SECTION - I (Envelope No. 1): Bid Security / EMD:**
  Bid security in accordance with tender document.

- **SECTION - II (Envelope No. 2): Technical Bid:**
  a. Information and documentary evidence establishing bidder's claim for meeting qualification criteria as stipulated in IFB. This section/envelope should necessarily contain all the required back-up documents for Bid Qualification.
  b. Technical bid complete with all technical and commercial details, covering letter and un-priced copy of price Schedule with prices substituted with 'QUOTED' or 'NOT QUOTED' or 'NOT APPLICABLE'. **Deviation sheet duly filled with deviations, if any, shall form part of technical bid.**

- **SECTION - III (Envelope No. 3): Price Bid:**

  a. PRICE BID WITH FULL PRICE DETAILS. The price bid shall contain prices only in the prescribed price schedule formats, without any technical and commercial details. Technical specifications or

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commercial terms given in unpriced schedule will only be evaluated and the same will be binding on the Bidder. The bids shall be sealed and kept in a single envelope with marking as Section - III (Price Bid) / Envelope No. 3: "Original'

b. The bidder shall quote the final prices (excluding taxes, Cess, duties and other levies etc) in the 'PRICE SCHEDULE FORMAT' of bid document ONLY. Prices quoted in any other format shall not be considered for evaluation.
c. The Price bid shall be kept in a larger envelope duly sealed and shall bear the name and address of the bidder.

B. The envelopes containing Section -I, Section -II, Section -III of bid shall be enclosed in a larger envelope duly sealed and pasted and shall bear the name and address of the bidder.
C. Bidder to note that if bid security / EMD (in the Proforma attached with these documents) in original and/or bid document fee (if the bid document is downloaded) is kept in any other envelope and not found in envelope no. 1, the offer of the bidder(s) will be REJECTED during opening.
D. Bidder to note that prices are to be quoted in the format provided in the price schedule formats provided along with the tender without any conditions. Price bids submitted in any other format and conditional price bids will be liable to be rejected. Price bids received in open condition (not in sealed envelope) or kept in any other Section of the bid (i. e, Section - I or II) will also be liable for rejection.
E. If the outer envelope is not sealed and not marked as required, then DAFFPL will assume no responsibility for the bid's misplacement or premature opening.
F. Bidders in their own interest shall ensure that they send their bid complete in all respects well in time to reach the specified office within the specified bid due date and time. No relaxation shall be given for delay due to any unforeseen event in submission of bid.
G. Central Public Sector Enterprises and Firms registered with NSIC are exempted from submission of Bid Security. Central Public Sector Enterprises are requested to give a self declaration on their letter head to this effect, which should be submitted in a sealed envelope marked as Bid Security.
H. Bidders registered with NSIC are also requested to submit self declaration on their letter head to this effect along with a copy of their Valid Registration certificate, specifying limit of volume and other details which should be submitted in a separate sealed envelope no. 1 marked as Bid security.
I. Bid Security strictly in the Proforma attached with these documents shall be submitted in Original along with the Bid. Bids received without original bid security, shall not be opened for evaluation.

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J. Tender document complete in all respects must be submitted in the tender box provided at the DAFFPL office before due date and time

33. DOCUMENTS COMPRISING THE BIDS

The bid prepared by the Bidder shall comprise the following components:

I. **ORIGINAL BID SECURITY (Section - I):** Bidders are advised to instruct their banks not to post Bid Security directly to Owner as the same has to accompany with the bid.

II. **TECHNICAL BID (Section -II):**

- Documentary evidence establishing Bidder's claim for meeting qualification criteria as stipulated in the Bid Document.
- Notarized Audited Annual Report of previous three financial years.
- Documentary evidence establishing Bidder's eligibility to bid and that the offered Goods conform to the Bid Document.
- Price Schedule (with Price figures blanked) completed in accordance with the requirements specified in the bid document.
- Agreed Terms & Conditions duly filled-in.
- Deviation Sheet, if any.
- Declaration with the bid qualification criteria that bidder has not been banned or delisted by any Government or quasi Government agencies or PSU's.
- Any other information/details/documents/data required as per Bid Document.
- Parent Company Guarantee, if applicable

III. **PRICE BID (Section -III):** Bid Form and Price Schedule (Both given along with tender) duly filled in.

34. BID FORM & PRICE SCHEDULE

The bidders shall complete the Bid Form and appropriate Price schedule furnished of Bid Document, indicating the required information for all quoted items.

35. FORMAT AND SIGNING OF BID

a. The Bidder shall prepare required number of copies of the bid, clearly marking each 'Original Bid' and 'Copy of Bid' as appropriate. In the event of any discrepancy between them, the 'Original Bid' shall govern.

b. The original and all copies of the bid shall be typed or written in indelible ink and shall be signed by the Bidder or a person or persons duly authorized to sign on behalf of the bidder on all pages of the bid. Such authorization shall be indicated by written Power of Attorney accompanying the bid. The name and position held by each person signing must be typed or printed below the

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signature. The person or persons signing the bid shall initial all pages of the bid, except for unamended printed literature.

c. The complete bid shall be without alterations, interlineations or erasures, except as may be necessary to correct errors made by the Bidder, in which case such corrections shall be rewritten & initialed by the person or persons signing the bid.
d. All the pages of the price bid shall be signed by the authorized signatory. In case all the pages of the price bid are not signed, the bid shall be rejected.

36. OPENING OF BIDS

Bids will be opened by Owner at DAFFPL Office, New Delhi, in the presence of bidders/bidders authorized representatives available on the opening date and time (duly authorized by a competent person and having the letter of authority).

a. **BID SECURITY / EMD (SECTION-I) AND TECHNICAL BID (SECTION-II):**
   I. On the day and time of bid opening, Bid security (Envelope 1) and Technical Bid (Envelope 2) shall be opened in presence of bidders.
   II. The Bidder's representatives, who are present, shall sign a register/attendance sheet evidencing their attendance.
   III. The Bidder(s) names, presence or absence of requisite bid security will be announced at the opening.
   IV. Bidder (s), whose bids are not opened for any reason, including non receipt of original bid security, will not be allowed to be present during bid opening.

b. **PRICE BID OPENING (SECTION -III):**
   I. Only those bidders whose bids meet the qualification criteria and are technically/commercially acceptable shall be called for opening of Price bid (Envelope 3) at a later date, informed in advance.
   II. The Bidder's representatives, who are present, shall sign a register/ attendance sheet evidencing their attendance.
   III. Bidder(s), whose bids are not opened for any reason, will not be allowed to be present during bid opening.

37. EVALUATION OF BIDS

a. Qualification of Bidder: The experience details and financial & technical capabilities of the bidder(s) shall be examined to determine whether the bidder(s) meet the Bid Qualification Criteria mentioned in the INVITATION FOR BIDS (IFB).
b. The Owner will examine the bids to determine whether they are complete, any computational errors have been made, whether the documents have been properly signed and whether the bids are generally in order.
c. The bids without requisite Bid Security and/or not in the prescribed

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proforma will not be considered and bids of such bidder Bidder(s) shall be rejected.

d. To assist in the examination, evaluation and comparison of technical bids, the owner/ may, at its discretion, ask the Bidder clarifications on the bid. The request for such clarifications and the response thereto shall be in writing.

e. Prior to the evaluation and comparison of the bid, the owner will determine the substantial responsiveness of each bid to the bidding documents. For the purpose of this Article, a substantially responsive bid is one, which conforms to all the terms and conditions of the bidding document without material deviations or reservations. A material deviation or reservation is one which affects in any substantial way the scope, quality, or performance of the works or which limits in any substantial way, inconsistent with the bidding document, the DAFFPL's rights or Bidder's obligation under the contract and retention of which deviation or reservation would affect unfairly the competitive position of other bidders presenting substantially responsive bids. The owner's determination of bid responsiveness is to be based on the contents of the bid itself without recourse to the extrinsic evidence.

f. A bid determined as substantially non-responsive will be rejected by the Owner and shall not subsequently be allowed by the Owner to be made responsive by the Bidder by correction of the non-conformity.

Note:

1) **The Bid Shall be submitted in English Language Only**
2) **For any Document submitted in any language other than English, the translation copy in English language shall be submitted.**

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CHAPTER 3: BID-QUALIFICATION CRITERIA:

Bidders need to meet following pre-qualification criteria to qualify for short-listing as a successful vendor, who would be considered for tendering process for the job of "***Construction of Sewerage System at DAFFPL"***

- ***Technical Criteria:***

  The bidder shall have satisfactorily executed either of the following during the last 7 years ending 30/09/2018:

  The Bidder should have completed at least **one similar work,** costing not less than **INR 30 Lakhs.**

  OR

  The Bidder should have completed at least **two similar works,** each costing not less than **INR 20 Lakhs.**

  OR

  The Bidder should have completed at least **three similar works,** each costing not less than **INR 16 Lakhs.**

  Note:

  - Similar works mean civil works like construction of buildings, Sewerage/Drainage systems.

  - Bidder shall submit the following documents in support of full filling the above criteria:

    - ✓ PO/WO copy for the works done in the past, indicating value of work.
    - ✓ Completion Certificate indicating P.O No & Date from User.

- ***Financial criteria for Job:***

  - Bidder shall have minimum average annual turnover of Rs. 60 Lakhs as per audited financial results in the preceding three financial/calendar years. "Turnover shall mean Consolidated Turnover in case of a Bidder having wholly owned subsidiaries"

Both the above criteria (Technical & Financial) to be met for acceptance of the bid.

OTHER INFORMATION OF PQC

1. Parties who are affiliates of one another can decide which affiliate will make a bid.

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Only one affiliate may submit a bid. Two or more affiliates are not permitted to make separate bids directly or indirectly. If 2 or more affiliates submit a bid, then any one or all of them are liable for disqualification. However up to 3 affiliates may make a joint bid as a consortium, and in which case the conditions applicable to a consortium shall apply to them. "Affiliate" of a Party shall mean any company or legal entity which:

a. Controls either directly or indirectly a Party, or
b. Which is controlled directly or indirectly by a Party; or
c. Is directly or indirectly controlled by a company, legal entity or Partnership which directly or indirectly controls a Party. "Control" means actual control or ownership of at least a 50% voting or other controlling interest that gives the power to direct, or cause the direction of, the management and material business decisions of the controlled entity.

2. Bids may be submitted by:
   a. A single person/ entity (called sole bidder);
   b. A newly formed incorporated joint venture (JV) which has not completed 3 financial years from the date of commencement of business;
   c. A consortium (including an unincorporated JV) having a maximum of 3 (three) members;
   d. An Indian arm of a foreign company.
3. Fulfillment of Eligibility criteria and certain additional conditions in respect of each of the above 4 types of bidders are stated below, respectively:
   a. The sole bidder (including an incorporated JV which has completed 3 financial years after date of commencement of business) shall fulfill each eligibility criteria.
   b. In case the bidder is a newly formed and incorporated joint venture and which has not completed three financial years from the date of commencement of business, then either the said JV shall fulfill each eligibility criteria or any one constituent member/ promoter of such a JV shall fulfill each eligibility criteria. If the bid is received with the proposal that one constituent member/ promoter fulfils each eligibility criteria, then this member/promoter shall be clearly identified and he/it shall assume all obligations under the contract and provide such comfort letter/guarantees as may be required by Owner. The guarantees shall cover inter alia the commitment of the member/ promoter to complete the entire work in all respects and in a timely fashion, being bound by all the obligations under the contract, an undertaking to provide all necessary technical and financial support to the JV to ensure completion of the contract when awarded, an undertaking not to withdraw from the JV till completion of the work, etc.
   c. In case the bidder(s) is/are a consortium (including an unincorporated JV), then the following conditions shall apply:
      I. Each member in a consortium may only be a legal entity and not an individual person;
      II. The Bid shall specifically identify and describe each member of the

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consortium;

III. the consortium member descriptions shall indicate what type of legal entity the member is and its jurisdiction of incorporation (or of establishment as a legal entity other than as a corporation) and provide evidence by a copy of the articles of incorporation (or equivalent documents);

IV. One participant member of the consortium shall be identified as the "Prime member" and contracting entity for the consortium;

V. This prime member shall be solely responsible for all aspects of the Bid/ Proposal including the execution of all tasks and performance of all consortium obligations;

VI. The prime member shall fulfill each eligibility criteria;

VII. a commitment shall be given from each of the consortium members in the form of a letter signed by a duly authorized officer clearly identifying the role of the member in the Bid and the member's commitment to perform all relevant tasks and obligations in support of the

VIII. Prime/lead member of the Consortium and a commitment not to withdraw from the consortium;

IX. No change shall be permitted in the number, nature or share holding pattern of the Consortium members after pre-qualification, without the prior written permission of the Owner.

X. No change in project plans, timetables or pricing will be permitted as a consequence of any withdrawal or failure to perform by a consortium member;

XI. No consortium member shall hold less than 25% stake in a consortium;

XII. Entities which are affiliates of one another are allowed to bid either as a sole bidder or as a consortium only;

XIII. Any person or entity can bid either singly or as a member of only one consortium.

d. In case the bidder is an Indian arm (subsidiary, authorized agent, branch office or affiliate) of a foreign bidder, then the foreign bidder shall have to full fill each eligibility criteria. If such foreign company desires that the contract be entered into with the Indian arm, then a proper back to back continuing (parent company) guarantee shall be provided by the foreign company clearly stating that in case of any failure of any supply or performance of the equipment, machinery, material or plant or completion of the work in all respects and as per the warranties/ guarantees that may have been given, then the foreign company shall assume all obligations under the contract. Towards this purpose, it shall provide such comfort letter/guarantees as may be required by Owner. The guarantees shall cover inter alia the commitment of the foreign company to complete the entire

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work in all respects and in a timely fashion, being bound by all the obligations under the contract, an undertaking to provide all necessary technical and financial support to the Indian arm or to render the same themselves so as to ensure completion of the contract when awarded, an undertaking not to withdraw from the contract till completion of the work, etc.

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CHAPTER 4: PERFORMANCE OF WORK

1. EXECUTION OF WORKS:
    a. All the works shall be executed in strict conformity with the provisions of the contract documents and with such explanatory detailed drawings, specifications, and instructions as may be furnished from time to time to the contractor by the Engineer-in-Charge whether mentioned in the contract or not. The contractor shall be responsible for ensuring that works throughout are executed in the most substantial, proper and workman like manner with the quality of material and workmanship in strict accordance with the specifications following all safety requirements of DAFFPL and as stipulated in work permits as per the directions and to the entire satisfaction of the Engineer-in-Charge.
    b. Wherever it is mentioned in the specifications that the Contractor shall perform certain work or provide certain facilities/materials, it is understood that the contractor shall do, so at his cost unless otherwise specified.
    c. The materials, design and workmanship shall satisfy the relevant Indian Standards, the Job specification contained herein and codes referred to. Where the job specification stipulate requirements in addition to those contained in the standards codes and specifications, these additional requirements shall also be satisfied.

2. COORDINATION AND INSPECTION OF WORK:
   The coordination and inspection of the day-to-day work under the contract shall be the responsibility of the Engineer-in-Charge. The written instructions regarding any particular job will be normally be passed by the Engineer-in-Charge or his authorized representative. A work order book / logbook will be maintained by the Contractor for each job in which the aforesaid written instructions will be entered. These will be signed by the contractor or his authorized representative by way of acknowledgment within 12 hours. The non-maintaining of the order book or non-signing by the contractor shall not preclude the contractor from complying with the instructions.

3. WORK IN MONSOON AND DEWATERING:
    a. The completion of the work may entail working in the monsoon also. The contractor must maintain a minimum labour force as may be required for the job and plan and execute the construction and erection according to the prescribed schedule. No extra rate will be considered for such work in monsoon.
    b. During monsoon and other period, it shall be the responsibility of the contractor to keep the construction work site free from water at his own cost.

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4. WORK ON SUNDAYS AND HOLIDAYS:
   For carrying out work on Sundays and Holidays if needed, the contractor will approach the Engineer-in-Charge or his representative at least two days in advance and obtain permission in writing. No special compensation on this account will be payable.

5. GENERAL CONDITIONS FOR CONSTRUCTION AND ERECTION WORK:
   a. Place of Work: The work has to be executed at specified premises as per the tender. Contractor should apprise himself of all the conditions prevailing in such location and the restrictions placed on movement of personnel and equipment, types of equipment and tools permitted, working methods allowed etc. in the light of security and safety regulations operative in the area. The safety regulations to be complied with, by the contractor will also be provided along with the tender. No idle time wages or compensation for temporary stoppage of work or restrictions would be paid, and the rate quoted for the various items of work should cover the cost of all such contingencies and eventualities. Substantial structures and utilities exist both above ground and underground, adjacent to the work site. (The construction activity gets restrained by the existence of such structures and utilities). Special care is necessary in transportation, storage, working on equipment's and other construction activities to protect the existing features and prevent damage to any facility. Necessary protective structures barricades, screens, signages etc. have to be erected at various places as directed by Engineer-in-Charge. No extra payment of such protective works will be made unless specially provided in the tender.
   b. The working time or the time of work is 48 hours per week normally. Overtime work is permitted in cases of need and the Owner will not compensate the same. Shift working at 2 or 3 shifts per day may become necessary and the contractor should take this aspect into consideration for formulating his rates for quotation. No extra claims will be entertained by the Owner on this account.
   c. The contractor must arrange for the placement of workers in such a way that the delayed completing of the work or any part thereof for any reasons whatsoever will not affect their proper employment. The Owner will not entertain any claim for idle time payment whatsoever.
   d. The contractor shall submit to the Owner reports at regular intervals regarding the state and progress of work. The details and preforma of the report will mutually be agreed after the award of contract.

6. DRAWINGS TO BE SUPPLIED BY THE OWNER:
   a. Where drawings are attached with tender, these shall be for the general guidance of the contractor to enable him to visualize the type of work

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contemplated and scope of work involved. The contractor will be deemed to have studied the drawings and formed an idea about the work involved.

b. Detailed working drawings on the basis of which actual execution of the work is to proceed will be furnished from time to time during the progress of the work. The contractor shall be deemed to have gone through the drawings supplied to him thoroughly and carefully and in conjunction with all other connected drawings and bring to the notice of the Engineer-in-Charge, discrepancies, if any, therein before actually carrying out the work.
c. Copies of all detailed working drawings relating to the works shall be kept at the contractor's office of the site and shall be made available to the Engineer-in-Charge at any time during the contract. The drawings and other documents issued by the Owner shall be returned to the Owner on completion of the works.

7. SETTING OUT WORKS:
   a. The Engineer-in-Charge shall furnish the contractor with only the four corners of the work site and a level bench mark and the contractor shall set out the works and shall provide efficient staff for the purpose and shall be solely responsible for the accuracy of such setting out.
   b. The contractor shall provide, fix and be responsible for the maintenance of all stacks, templates, level marks, profiles and other similar things and shall take all necessary precaution to prevent their removal or disturbance and shall be responsible for the consequence of such removal or disturbance should the same take place and for their efficient and timely reinstatement. The contractor shall also be responsible for the maintenance of all existing survey marks, boundary marks, distance marks and centre line marks, either existing or supplied and fixed by the contractor. The, work shall be set out to the satisfaction of the Engineer-in-Charge. The approval thereof or joining in setting out the work shall not relieve the contractor of any of his responsibilities.
   c. Before beginning the works, the contractor shall at his own cost, provide all necessary reference and level posts, pegs, bamboos, flags, ranging rods, strings and other materials for proper layout of the work in accordance with the scheme, for bearing marks acceptable to the Engineer-in-Charge. The centre, longitudinal or face lines and cross lines shall be marked by means of small masonry pillars. Each pillar shall have distinct marks at the centre to enable theodolite to be set over it. No work shall be started until all these points are checked and approved by the Engineer-in-Charge in writing but such approval shall not relieve the contractor of any of his responsibilities. The contractor shall also provide all labour, material and other facilities, as necessary, for the proper checking of layout and inspection of the points during construction.
   d. Pillars bearing geodetic marks located at the site of work under construction should be protected and fenced by the contractor.

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e. On completion of works, the contractor must submit the geodetic documents according to which the work was carried out.

8. RESPONSIBILITY FOR LEVEL AND ALIGNMENT:
The contractor shall be entirely and exclusively responsible for the horizontal and vertical alignment, the levels and correctness of every part of the work and shall rectify effectually any errors or imperfections therein. Such rectifications shall be carried out by the contractor, at his own cost, when instructions are issued to that effect by the Engineer-in-Charge.

9. MATERIALS TO BE SUPPLIED BY CONTRACTOR:
   a. The contractor shall procure and provide the whole of the materials required for construction including tools, tackles, construction plant and equipment for the completion and maintenance of the works except the materials which will be issued by Owner and shall make his own arrangement for procuring such materials and for the transport thereof. The materials procured by the contractor shall be DAFFPL approved/specified quality.
   b. All materials procured should meet the specifications given in the tender document. The Engineer-in-Charge may, at his discretion, ask for samples and test certificates for any batch of any material procured. Before procuring, the contractor should get the approval of Engineer-in-Charge for any material to be used for the works.
   c. Manufacturer's certificate shall be submitted for all materials supplied by the contractor. If, however, in the opinion of the Engineer-in-Charge any tests are required to be conducted on the materials supplied by the contractor, these will be arranged by the contractor promptly at his own cost.

10. MATERIALS SUPPLIED BY OWNER:
   a. If the specifications of the work provides for the use of any materials of special description to be supplied from the Owner's stores, price for such material to be charged therefore as herein after mentioned being so far as practicable for the convenience of the contractor but not so as in any way to control the meaning or effect of the contract. The contractor shall be bound to purchase and shall be supplied such materials as are from time to time required to be used by him for the purpose of the contract only. The sums due from the contractor for the value of the actual materials supplied by the Owner will be recovered from the running account bill on the basis of the actual consumption of materials in the work covered and for which the running account bill has been prepared. After the completion of the works, however, the contractor has to account for the full quantity of materials supplied to him as per relevant clauses in this document.
   b. The value of the materials as may be supplied to the contractor by the Owner will be debited to the contractor's account at the rates shown in the schedule of chargeable materials and if they are not entered in the schedule, they will

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be debited at cost price, which for the purpose of the contract shall include the cost of carriage and all other expenses whatsoever such as normal storage supervision charges which shall have been incurred in obtaining the same at the Owner's stores. All materials so supplied to the contractor shall remain the absolute property of the Owner and shall not be removed on any account from the site of the work, and shall be at all times open for inspection to the Engineer-in-Charge. Any such materials remaining unused at the time of completion or termination of the contract shall be returned to the Owner's stores or at a place as directed by the Engineer-in- Charge in perfectly good condition, at contractor's cost.

11. CONDITIONS FOR ISSUE OF MATERIALS:

a. Materials specified to be issued by the Owner will be supplied to the contractor by the Owner from his stores/location. It shall be the responsibility of the contractor to take delivery of the materials and arrange for its loading, transport and unloading at the site of work at his own cost. The materials shall be issued between the working hours and as per the rules of the Owner framed from time to time.
b. The contractor shall bear all incidental charges for the storage and safe custody of materials at site after these have been issued to him.
c. Materials specified to be issued by the Owner shall be issued in standard sizes as obtained from the manufacturer.
d. The contractor shall construct suitable godown at the site of work for storing the materials safe against damage by rain, dampness, fire, theft etc. He shall also employ necessary watch and ward establishment for the purpose.
e. It shall be duty of the contractor to inspect the material supplied to him at the time of taking delivery and satisfy himself that they are in good condition. After the materials have been delivered by the Owner, it shall be the responsibility of the contractor to keep them in good condition and if the materials are damaged or lost, at any time, they shall be repaired and/ or replaced by him at his own cost, according to the directions of the Engineer-in-Charge.
f. The Owner shall not be liable for delay in supply or non-supply of any materials which the Owner has undertaken to supply where such failure or delay is due to natural calamities, act of enemies, transport and procurement difficulties and any circumstances beyond the control of the Owner. In no case, the contractor shall be entitled to claim any compensation or loss suffered by him on this account.
g. It shall be the responsibility of the contractor to arrange in time all materials required for the works other than those to be supplied by the Owner. If, however, in the opinion of the Engineer-in-Charge the execution of the work is likely to be delayed due to the contractor's inability to make arrangements for supply of materials which normally he has to arrange for, the Engineer-in-Charge shall have the right, at his own discretion, to Issue such materials If

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available with the Owner or procure the materials from the market or elsewhere and the contractor will be bound to take such materials at the rates decided by the Engineer-in-Charge. This, however, does not in any way absolve the contractor from responsibility of making arrangements for the supply of such materials in part or in full, should such a situation occur, nor shall this, constitute a reason for the delay in the execution of the work.

h. None of the materials supplied to the contractor will be utilized by the contractor for manufacturing item, which can be obtained from standard manufacturer in finished form.
i. The contractor shall, if desired by the Engineer-in-Charge, be required to execute an indemnity bond for safe custody and accounting of all materials issued by the Owner.
j. The contractor shall furnish to the Engineer-in-Charge sufficiently in advance a statement showing his requirements of the quantities of the materials to be supplied by the Owner and the time when the same will be required by him for the works, so as to enable the Engineer-in-Charge to make necessary arrangement for procurement and supply of the material.
k. A daily account of the materials issued by the Owner shall be maintained by the contractor indicating the daily receipt, consumption and balance in hand. This account shall be maintained in a manner prescribed by the Engineer-in-Charge along with all connected papers viz. requisition, issues etc. and shall be always available for inspection in the contractor's office at site.
l. The contractor should see that only the required quantities of materials are got issued. The contractor shall not be entitled to cartage and incidental charges for returning the surplus materials, if any, to the stores/location where from they were issued or to the place as directed by the Engineer-in-Charge.
m. Materials/ Equipment supplied by Owner shall not be utilized for any other purpose(s) than issued for.

12. MATERIALS PROCURED WITH ASSISTANCE OF OWNER:

Notwithstanding anything contained to the contrary in any or all the clause of this document where any materials for the execution of the contract are procured with the assistance of Owner either by issue from Owner's stock or purchase made under orders or permits or licences issued by Government, the contractor shall hold the said materials as trustee for the Owner and use such materials economically and solely for the purpose of the contract and not dispose them off without the permission of the owner and return, if required by the Engineer-in-Charge, all surplus or unserviceable materials that may be left with him after the completion of the contract or at its termination for any reason, whatsoever on his being paid or credited such prices as the Engineer in-Charge shall determine having due regard to the condition of the materials. The price allowed to the contractor however, shall not exceed the amount charged to him excluding the storage charges if any. The decision of the Engineer-in- Charge shall be final and conclusive in such matters. In the event

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of breach of the aforesaid condition, the contractor shall in terms of the licenses or permits, and/or for criminal breach of trust, be liable to compensate the Owner a double rate or high rate, in the event of those materials at that time having higher rate or not being available in the market, then any other rate to be determined by the Engineer-in-Charge and his decision shall be final and conclusive.

13. MATERIALS OBTAINED FROM DISMANTLING:
    If the contractor in the course of execution of the work is called upon to dismantle any part for reasons other than those stipulated in clauses 64 & 68 hereunder, the materials obtained in the work of dismantling etc. will be considered as the Owner's property and will be disposed off to the best advantage of the Owner.

14. ARTICLES OF VALUE FOUND:
    All gold, silver and other materials, of any description and all precious stones, coins, treasure relies, antiquities and other similar things which shall be found in, under or upon the site, shall be property of the Owner and the contractor shall duly preserve the same to the satisfaction of the Engineer-in-Charge and shall from time to time deliver the same to such person or person indicated by the Owner.

15. DISCREPANCIES BETWEEN INSTRUCTIONS:
    Should any discrepancy occur between the various instructions furnished to the contractor, his agents or staff or any doubt, arise as to the meaning of any such instructions or should there be any misunderstanding between the contractor's staff and the Engineer-in-Charge's staff, the contractor shall refer the matter immediately in writing to the Engineer-in-Charge whose decision thereon shall be final and conclusive and no claim for losses alleged to have been caused by such discrepancies between instructions, or doubts, or misunderstanding shall in any event be admissible.

16. ALTERATIONS IN SPECIFICATIONS AND DESIGNS AND EXTRA WORK:
    a. The Engineer-in-Charge shall have power to make any alterations in, omissions from, additions to of substitutions for, the schedule of rates, the original specifications, drawings, designs and instructions that may appear to him to be necessary or advisable during the progress of the work and the contractor shall be bound to carry out such altered / extra / new items of work in accordance with any instructions which may be given to him in writing signed by the Engineer-in-Charge and such alterations, omissions, additions or substitutions shall not invalidate the contract and any altered additional or substituted work which the contractor may be directed to do in the manner above specified as part of the work shall be carried out by the contractor on the same conditions in all respect on which he agree to do the main work. The time for completion of work may be extended for the part of the particular job at the discretions of the Engineer-in-Charge, for only such alteration, additions or substitutions of the work, as he may consider as just

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and reasonable. The rates for such additional, altered or substituted work under this clause shall be worked out in accordance with the following provisions:

- If the rates for the additional, altered or substituted work are specified in the contract for the work, the contractor is bound to carry out the additional, altered or substituted work at the same rates as are specified in the contract.
- If the rates for the additional, altered or substituted work are not specifically provided in the contract for the work, the rates will be derived from the rates for similar class of works as specified in the contract for the work. The opinion of the Engineer-in-Charge as to whether the rates can be reasonably so derived from items in the contracts will be final and binding on the contractor.
- If the rates for the altered, additional or substituted work cannot be determined in the manner specified in sub-clause (a) and (b) above, then the contractor shall inform the Engineer-in-Charge of the rate which is his intension to charge for such class of work supported by analysis of the rate or rates claimed, and the Engineer-in-Charge shall determine the rates on the basis of the prevailing market rates of materials, labour cost at schedule of labour plus 10% to cover contractor's supervision, overheads and profit and pay the contractor accordingly. The opinion of the Engineer-in-Charge as to the current market rates of materials and the quantum of labour involved per unit of measurement will be final and binding on the contractor.
- Provisions, contained in sub-clause mentioned above shall not, however, apply: Where the value of alterations / additions / deletions or substitutions exceeds beyond plus or minus 25% of the estimated contract value (i.e. quoted item rates of contractor shall hold good for variations etc. within plus or minus 25% of estimated contract value)

b. In the event and as a result of such alternatives / additions / substitutions / deletion, the scope of contract work exceed the value stipulated in the contract by more than the limits given in clause above, the Contractor shall claim revision of the rates supported by the proper analysis in respect of such items for quantities in excess of the above limits, notwithstanding the fact that the rates for such items exist in the tender for the main work or can be derived in accordance with the provision of sub-clause (b) of Clause 61 A, and the Engineer-in-Charge may revise their rates having regard to the prevailing market rates, and the contractor shall be paid in accordance with the rates so fixed. But, under no circumstances the contractor shall suspend / stop / slowdown the work on the plea of non-settlement of rates of items falling under this clause.

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17. ACTION WHERE NO SPECIFICATIONS ISSUED:
In case of any class of work for which there is no such specification given by the Owner in the tender documents, such work shall be carried out in accordance with Indian Standard Specifications and if the Indian Standard Specifications do not cover the same the work should be carried out as per standard Engineering Practice subject to the approval of the Engineer-in-Charge.

18. ABNORMAL RATES:
The contractor is expected to quote rate for each item after analysis of cost involved for the completion of item/work, considering all specifications and conditions of contract. This will avoid loss of profit or gain, in case of curtailment or change of specification for any item. In case it is noticed that the rates for any item, quoted by the tenderer unusually are high or unusually low it will be sufficient cause for the rejection of the tender unless the Owner is convinced about the reasonableness of the rates on scrutiny of the analysis for such rate to be furnished by the tenderer on demand.

19. INSPECTION OF WORK:
    a. The Engineer-in-Charge will have full power and authority to inspect the works at any time wherever in progress either on the Site or at the contractor's premises / workshop where situated premises /workshops of any person, firm or corporation where work in connect with the contract may be in hand or where materials are being or are to be supplied, and the contractor shall afford or procure for the Engineer-in-Charge every facility and assistance to carry out such Inspection. The contractor shall at all time during the usual working hours and at all other time for which reasonable notice of the intention of the Engineer in-Charge or his representative to visit the works have been given to the contractor, either himself be present to receive order and instructions or post a responsible agent duly accredited in writing for the purpose. Orders given to the contractor's agent shall be considered to have the same force as if they had been given to the contractor himself. The contractor shall give not less than seven days, notice in writing to the Engineer-in-Charge before covering up or placing any work beyond reach of inspection and measurement any work in order that the same may be inspected and measured. In the event of breach of above the same shall be uncovered at contractor's expense carrying out such measurement or inspection.
    b. No materials shall be dispatched by the contractor before obtaining the approval of Engineer-in-Charge in writing. The contractor is to provide at all times during the progress of the work and the maintenance period, proper means of access with ladders, gangways, etc. and the necessary attendance to move and adopt as directed for inspection or measurement of the works by the Engine in-Charge.

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20. ASSISTANCE TO THE ENGINEERS:

The contractor shall make available to the Engineer-in-Charge, free of cost necessary instruments and assistance in checking of setting out of works and taking measurement of work.

21. TESTS FOR QUALITY OF WORKS:

a. All workmanship shall be of the respective kinds described in the contract documents and in accordance with the instructions of the Engineer-in-Charge and shall be subjected from time to time to such test at contractor's cost as the Engineer-in-Charge may direct at place of manufacture or fabrication or on the site or at all or any such places. The contractor shall provide assistance, instruments, labour and materials as are normally required for examining, measuring and testing any workmanship as may be selected and required the Engineer-in-Charge.
b. All the tests necessary in connection with the execution of the work as decided by Engineer-in-Charge shall be carried out at the field testing laboratory of the Owner by paying the charges as decided by the Owner from time to time. In case of non-availability of test facility with the Owner, the required test shall be carried out at the cost of contractor at government or any other testing laboratory as directed by Engineer-in-Charge.
c. If any tests are required to be carried out in connection with the work or materials workmanship not supplied by the contractor, such tests shall be carried out by the contractor as per the instructions of Engineer-in-Charge and cost of such tests shall be reimbursed by the Owner.

22. SAMPLES:

The contractor shall furnish to the Engineer-in-Charge for approval when requested or if required by the specifications, adequate samples of all materials and finishes to be used in the work. Such samples shall be submitted before the work is commenced and in ample time to permit tests and examinations thereof. All materials furnished and finishing applied in actual work shall be fully identical to the approval samples.

23. ACTION AND COMPENSATION IN CASE OF BAD WORK:

If it shall appear to the Engineer-in-Charge that any work has been executed with unsound, imperfect or unskilled workmanship or with materials of any inferior description, or that any materials or articles provided by the contractor for the execution of the work are unsound or of a quality inferior to that contracted for, or otherwise not in accordance with the contract, the contractor shall on demand in writing from the Engineer-in-Charge or his authorized representative, specifying the work, materials or articles complained of, notwithstanding that the same have been inadvertently passed, certified and paid for forthwith shall rectify or remove and reconstruct the works specified and provide other proper and suitable materials or articles at his own charge and cost, and in the event of failure to do so within a

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period to be specified by the Engineer-in-Charge in his demand aforesaid, the contractor shall be liable to pay compensation at the rate of 0.5% of the estimated cost of the whole work, for every week limited to a maximum of 10% of the estimated cost of the whole work, while his failure to do so shall continue and in the case of any such failure the Engineer-in-Charge may on expiry of notice period rectify or remove and re-execute the work or remove and replace with others, the materials or articles complained of as the case may be at the risk and expenses of the contractors in all respects. The decision of the Engineer-in-Charge as to any question arising under this clause shall be final and conclusive.

24. SUSPENSION OF WORKS:

The contractor shall, if ordered in writing by the Engineer-in-Charge or his representative, temporarily suspend the works or any part thereof for such period and such time as so ordered and shall not, after receiving such written order, proceed with the work therein ordered to be suspended, until he shall have received a written order to proceed therewith. The contractor shall not be entitled to claim/ compensation for any loss or damage sustained by him by reason of temporary suspension of the works aforesaid. An extension of time for completion, corresponding with the delay caused by any such suspension of the works as aforesaid will be granted to the contractor, should he apply for the same, provided that suspension was not consequent to any default or failure on the part of the contractor.

25. OWNER MAY DO PART OF WORK:

Upon failure of the contractor to comply with any instructions given in accordance with the provisions of the contract, the owner has the alternative right, instead of assuming charge for entire work to place additional labour force, tools, equipments and materials on such parts of the work, as the owner may designate or also engage another contractor to carry out the work. In such cases, the owner shall deduct from the amount which otherwise might become due to the contractor, the cost of such work and materials with ten percent added to cover all departmental charges and should the total amount thereof exceed the amount due to the contractor, the contractor shall pay the difference to the owner.

26. POSSESSION PRIOR TO COMPLETION:

The Engineer-in-Charge shall have the right to take possession of or use any completed or partially completed work or part of the work. Such possessions or use shall not be deemed to be an acceptance of any work completed in accordance with the contract agreement. If such prior possession or use by the Engineer-in-Charge delays the progress of work, suitable adjustment in the time of completion will made and contract agreement shall be deemed to be modified accordingly.

27. PERIOD OF LIABILITY FROM THE DATE OF COMPLETION OF WORK:

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a. The contractor shall guarantee the installation/site work for a period of 12 (twelve) Months from the date of completion of work, unless otherwise specified. Any damage that may lie undiscovered at the time of issue of completion certificate, connected in any way with the equipment or materials supplied by him or in the workmanship shall be rectified or replaced by the contractor at his own expense as deemed necessary by the Engineer-in-Charge or in default, the Engineer-in-Charge may cause the same made good by other workmen and deduct expenses (for which the certificate of Engineer-in-Charge shall be final) from any sums that may be then or at any time thereafter, become due to the contractor or from his security deposit.

b. If the contractor feels that any variation in work or in quality of materials or proportions would be beneficial or necessary to fulfill the guarantee called for, he shall bring this to the notice of the Engineer-in-Charge in writing. The work will not be considered as complete and taken over by the Owner until all the temporary works etc., constructed by the contractor is removed and work site cleaned to the satisfaction of Engineer-in-Charge.

c. Care of Works:
From the commencement to completion of works, the contractor shall take full responsibility for the care of all works including all temporary works, and in case any damage, loss or injury happens to the works or to any part thereof or to any temporary work, from any cause whatsoever, he shall at own cost repair and make good the same, so that at completion, the work shall be in good order and in conformity in every respect with the requirements of the contract and the Engineer-in-Charge's instructions.

d. Effects prior to taking over: If at any time, before the work is taken over, the Engineer-in-Charge shall
   - Decide that any work done or materials used by the contractor or any sub-contractor is defective or not in accordance with the contract or that the works or any portion thereof are defective or do not fulfill the requirements of contract (all such matters being herein after called 'Defects' in this clause) and
   - As soon as reasonably practicable, notice given to the contractor in writing of the said decisions specifying particulars of the defects alleged to exist or to have occurred, then the contractor shall at his own expenses and with all speed make good the defects so specified. In the case contractor shall fail to do so, the Owner may take, at the cost of the contractor, such steps as may in all circumstances, be reasonable to make good such defects. The expenditure, so incurred by the Owner shall be recovered from the amount due to the contractor. The decision of the Engineer-in-Charge with regard to the amount be recovered from the contractor will be final and binding on the contractor. As soon as the works have been completed in accordance with the contract and have passed the tests on completion, the Engineer-in-Charge shall issue a certificate (hereinafter called

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completion certificate) in which he shall certify the date on which the work have been so completed and have passed the said tests and the Owner shall be deemed to have taken over the works on the date so certified. If the works have been divided into various groups in the contract, the Owner shall be entitled to take over any group or groups before the other or others and thereupon the Engineer-in-Charge shall issue a completion certificate which will however, be for such group or groups as taken over only.

e. Defects after taking over: In order that the contractor could obtain a completion certificate, he shall make good with all possible speed, any defect arising from the defective materials supplied by the Contractor or workmanship or any act of omission of the contract that may have been noticed or developed after the works or group of the works has been taken over. The period allowed for carrying out such work will be normally one month. If any defect be not remedied within a reasonable time, the Owner may proceed to do the work at the contractor's risk and expense and deduct from the final bill such amount as may be decided by the Owner. If by reason of any default on the part of the contractor a completion certificate has not been issued in respect of every portion of the work within one month after the date fixed by the contract for the completion of the works, the Owner shall be at his liberty to use the works or any portion thereof in respect of which a completion certificate has been issued provided that the works or the portion thereof so used as aforesaid shall be afforded reasonable opportunity for completing these works for the issue of completion certificate.

f. The Security Deposit/retention money deducted / furnished shall be retained for the period of liability as given in clause above. This Retention amount or Bank Guarantee furnished against Security Deposit/retention money shall be released only on expiry of the period of liability and also based on the certification of the Engineer-in-charge that no defect/damage has been reported / observed during the stipulated period of liability for the contract.

g. Performance of contractor shall be evaluated on each job by Engineer-in-Charge and recorded. Review of performance will be carried out at appropriate intervals by DAFFPL.

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CHAPTER 5: GENERAL TERMS & CONDITIONS:

1. General:
   The materials and workmanship shall satisfy the relevant Indian Standards, the job specifications contained herein & codes referred to. Where the job specifications stipulate requirements in addition to those contained in the standard codes and specifications, these additional requirements shall also be satisfied.

   In the absence of any standard / specification / codes of practice for detailed specifications covering any part of the work covered in this tender document, the instruction / direction of consultant engineer will be binding on the contractor.

   Wherever it is stated in this tender document that a particular supply is to be effected or that a particular work is to be carried out, it shall be understood that the same shall be affected / carried out by the contractor at his cost, unless a different intention is specifically and expressly stated herein or otherwise explicit from the context.

2. Construction Program:
   A detailed bar chart showing various activities shall be prepared by the tenderers. The work shall be executed strictly as per the agreed time schedule. The period of completion shall include, the time required for mobilization and testing as well as rectification, if any, testing & completion in all respects to the entire satisfaction of the consultant.

   A joint programme of execution programme shall be prepared by the contractor.

   Monthly / weekly construction programme shall be made by the contractor. The contractor shall scrupulously adhere to these targets / programme by deploying adequate personal and construction tools and tackles. He shall also supply all materials in his scope of supply in time to achieve the targets set out in the weekly and the monthly programme.

   The contractor shall give every day, a report on labour and equipment deployed along with the progress of the work done on previous day, for each category of work.

3. Construction Water and Power:

   - ✓ The contractor has to make necessary arrangement for metering and further distribution for water & power both required for construction &

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testing at no extra cost. All arrangement/material shall be as per electrical rules/standards/Approved makes.

- ✓ Electricity will be provided by DAFFPL @ Rs. 14.50 per unit.
- ✓ Water will be provided based on monthly consumption as follows :
  - upto 6Kl-INR 20/Kl
  - 06-15Kl-INR 30/Kl
  - 15-25Kl-INR 40/Kl
  - 25-50Kl-INR 100/Kl
- ✓ All above water tariffs are subjected to change as per government revisions.
- ✓ The DAFFPL shall not take any guarantee for the supply of water & electricity and will not relieve the contractor of his responsibility in making his own arrangement and for the timely completion of the various works as stipulated.

4. Safety Rules and Regulations:
   All Safety rules and regulations of the terminal operator have to be followed by the contractor without fail. If any damage occurs due to negligence of safety, contractor will be held responsible for the same.

5. Tests and Inspection:
   The contractor shall carry out the various tests as enumerated in the technical specifications of this tender document and the technical documents that will be furnished to him during the performance of the work. No separate payment shall be made.

   The contractor shall carry out at his cost, all the tests either on the field or through external institutions / laboratories, concerning the execution of the work and supply of materials by the contractor.

   Any work not conforming to the execution drawings, specifications or codes shall be rejected forthwith and the contractor shall carry out the rectification at this own cost. Results of all inspection & tests shall be recorded in the inspection reports, test reports, etc., which will be approved by the Engineer-in-charge. These reports shall form part of the completion documents.

   Inspection & Acceptance of works shall not relieve the contractor from any of his responsibilities under this contract.

6. Site Cleaning:
   The contractor shall take care to clean the working site from time to time for easy access to work site and for safety. Working site should be always kept cleared to the entire satisfaction of DAFFPL.

   Before handing over any work to the owner, the contractor in addition to other

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formalities to be observed as detailed in the document shall clear the site to the entire satisfaction of DAFFPL.

7. Coordination with other Agencies:
   Work shall be carried out in such a manner that the work of other agencies operating at the site is not hampered due to any action of the contractor. Proper coordination with other agencies will be the responsibility of the contractor. In case of any dispute, the decision of Engineer-in-charge shall be final and binding on the contractor.

8. DAFFPL reserves the right to accept any tender in whole and reject any or all tenders without assigning any reason. DAFFPL also reserves the right to allow public enterprises (Central/State) Price / purchase /contract / service preference as admissible under the Indian Government Policy.

9. BID PRICES:
   a) Prices shall be furnished strictly in the Price Bid format of the tender document.
   b) Bidder should quote their lowest and best offered price. Prices so quoted will remain firm till satisfactory completion of order. The price will not be subjected to escalation for any reason whatsoever.
   c) Bidders quoted prices shall be deemed to include entire Specification of item and all obligations and responsibilities to be carried out / executed by the Bidder as per terms of tender document. It is clearly understood by the Vendor that it is for the Vendor to ascertain and assess the applicable Acts/ Regulations/ Laws etc., entirely of their own. It is also for the Vendor to ascertain and assess the applicability of taxes, duties, levies etc. In case of any difference of opinion between Vendors proposal and interpretation by any tax/assessing (or similar) authorities, on the rate or terms and conditions related to taxes and duties etc., owners liability shall be strictly as per terms/provisions of the contract based on tender document and Vendors offer.
   d) No other charges accept those mentioned in the tender document will be payable to vendor.

10. The materials should be properly packed so as to withstand all transit hazards. Materials are required to be dispatched by the vendor to the locations, on freight paid DOOR- DELIVERY CONSIGNEE COPY ATTACHED basis along with copies of Inspection release note & internal test certificates & other documents as mentioned elsewhere in this tender document.

11. All shipment shall be under deck unless carriage on deck is unavoidable.

12. Bidder to note that Special Packaging Requirement as in technical specifications of

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this tender. The materials should be properly packed so as to withstand all transit hazards (both ocean & inland transit).

13. Indian agent Commission will not be paid by the owner.

14. TAXES & DUTIES:
    a) Bidder(s) quoted prices shall be exclusive of all taxes, duties, cess, levies etc.,
    b) The invoice should clearly mentioned that applicable Excise Duty, Education Cess or any other taxes charged and paid / payable on quoted item to enable the owner to claim MODVAT / Input credit.
    c) The statutory variation in Excise duty, Education Cess and Sales tax / VAT on finished goods and introduction of new tax, from bid due date till the contractual completion period shall be to owner account against submission of the documentary evidence. However, any increase in the rate of these taxes and duties beyond the contractual delivery period shall be to Seller account. Any decrease in the rate of these taxes and duties shall be passed on to the owner. Any additional excise duty due to increase in turn-over would be to seller account.
    d) It is for the Bidder to assess and ascertain the rate of excise duty, education Cess and sales tax/VAT applicable on quoted items. It is clearly understood that Owner will not have any additional liability towards payment of Excise Duty, Education Cess, GST and Sales Tax/VAT which is based on Bidders wrong assessment / interpretation of applicability of such Excise Duty and/or education cess and / or Sales Tax/VAT.
    e) Successful bidder shall carry out its obligations towards services at site as mentioned in technical specifications without any extra charges.
    f) Octroi/Entry tax, if any, in the any state of India shall be directly paid by the vendor, if applicable.
    g) DAFFPL shall not be liable, in case the tax authorities assess the tax elements in a different way on account of any reason, whatsoever.
    h) Taxes and duties other than those specified in this document, if any, shall be included in the quoted prices and no separate reimbursement shall be made by DAFFPL.

15. Income Tax / Corporate Tax :
    a) As regards Income Tax, Surcharge on Income Tax or any other Corporate Tax payable by the Bidder for reason of the contract awarded, and / or on their expatriate personal, the Owner shall not bear any Tax liability whatsoever, irrespective of the mode of construction of contract / order. The Bidder shall be liable and responsible for payment of such tax, if attracted under the provision of Indian Income Tax Act.
    b) Bidder may note that if any tax is deductible at source as per Indian Income Tax Law, the same will be so deducted before releasing any payment to the

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Bidder and a TDS (Tax deducted at source) certificate will be furnished to the Bidder.

c) Accordingly, Bidder shall have the responsibility to check and include such provision of taxes in the prices.

d) In case of delay in delivery due to reasons attributable to Bidder, any new or additional taxes or duties levied by Statutory authorities during this period shall be borne by the Bidder.

16. EMD / BID SECURITY

a) The bidder shall furnish, as part of his bid, a bid security in original for the amount specified in the tender document by way of pay order, bank guarantee on Rs.100/-value non-judicial stamp paper or demand draft.

b) The bid security is required to protect the Owner against the risk of Bidders conduct, which would warrant the security forfeiture.

c) If bid Security / EMD is in the form of bank guarantee, it shall be in the form of irrevocable bank guarantee (in the format attached) issued by any Indian Scheduled Bank (other than Co-operative Bank) will be accepted.

d) Bid Security / EMD shall be issued in favour of M/s Delhi Aviation Fuel Facility (P) Limited, New Delhi. .

e) Unsuccessful bidders bid security without any interest will be discharged/ returned as promptly as possible, but not later than 60 days after the expiry of the period of bid validity prescribed by the Owner.

f) The successful bidder bid security without any interest will be discharged, upon the Bidder accepting the Contract/ Purchase Order and furnishing the Contract performance bank guarantee to DAFFPL.

g) The bid security may be forfeited:

   i. If a bidder withdraws his bid during the period of bid validity or

   ii. In the case of a successful bidder, if the bidder fails or refuses to:

      - Accept the Purchase Order in accordance with agreed terms and conditions.
      - Furnish Contract performance bank guarantee as per bid document/ Purchase Order.

   iii. Detection of submission of false / forged documents and fraud.

h) Bid Security / EMD should be in favour of "Delhi Aviation Fuel Facility Private Limited", payable at New Delhi and submitted to the relevant office of DAFFPL as mentioned in covering note of the tender document. Covering letter to bid Security / EMD must indicate the tender number. This is essential to have proper co-relation at a later date. The bid security / EMD shall be strictly in the form provided in the bid document before the due date & time of bid submission.

i) Central Public Sector Undertaking of Govt. Of India are exempted from furnishing the bid security. Firms registered with NSIC/ MSME are also

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exempted from furnishing bid security, provided they are registered for the tendered items and up to the monetary limit they intend to quote. Provided further that they submit a copy of the current and valid registration certificate for the quoted item and monetary value along with their bid(s). Owner reserves right to verify the registration certificate provided, with relevant authorities.

17. CONTRACT PERFORMANCE BANK GUARANTEE [CPBG]

a) As a Performance security, the successful Bidder, to whom the work is awarded by, shall be required to furnish within 30 days of notification of award of contract (Letter/ Fax/e-mail of Intent) a Performance Bank Guarantee on RS.100/- VALUE non-judicial stamp paper in favour of the Owner (M/S DAFFPL).
b) The Bank Guarantee amount shall be equal to TEN PERCENT (10%) of the Total Order Value and it shall guarantee the faithful performance of the Order in accordance with the Terms and conditions specified in the documents and specifications.
c) CPBG shall be in the form of an irrevocable Bank Guarantee (in the format attached) issued by any Indian Scheduled Bank (other than Co-operative Bank).
d) The Bank Guarantee shall be valid for the entire period of the Contract, namely, till the end of the guarantee / warranty period. The guarantee amount shall be payable on demand to the Owner.
e) In case, the Contract Performance Bank Guarantee stated above gets reduced/ deducted for reasons of non-fulfillment of any Contractual obligations upto the completion of guarantee period, the bidder shall immediately take action to increase the value of Bank Guarantee to TEN PERCENT (10%) of the Contract price, to cover his guarantee/warranty obligations.
f) The Performance Guarantee will be returned to the bidder without any interest at the end of the warranty / guarantee period subject to fulfillment of all contractual obligations by the Bidder. The bank guarantee shall have a claim period of 3 months beyond the contractual guarantee period.
g) The proceeds of performance security shall be appropriated by the owner as compensation for any loss resulting from vendor's failure to complete his obligations under the contract to the prejudice to any of the rights or remedies the owner may be entitled to as per terms and conditions of contract. The proceeds of this performance security shall also govern the successful performance of goods and services and vendors all obligations during the entire period of contractual warrantee / guarantee.

18. PRICE REDUCTION FOR DELAY IN DELIVERY:

a) The completion period quoted must be realistic & specific. The inability of

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successful bidder to execute orders in accordance with the agreed completion schedule will entitle DAFFPL, at its options, to:

b) Accept delayed delivery at prices reduced by a sum equivalent to half percent (0.5%) of the value of any goods/work not delivered for every week of delay or part thereof, limited to a maximum of 10% of the total order value. Date of completion of work shall be considered for calculation of price reduction

c) The price reduction clause shall become applicable for works done beyond the schedule completion period.

19. INSURANCE

Supplier shall carry and maintain any and all statutory insurance(s) required under Indian Laws and Regulations, including Workmen compensation Act/ESI/Third party liabilities etc. and insurances for their personnel engaged in performance of the work at their own cost.

20. INSPECTION:

a) Material / construction shall be inspected by owner or its representative. Charges other than third party inspection, is entirely vendor responsibility and in no way should affect the completion schedule.

b) OWNER may, at its own expense, witness any test or inspection. In order to enable OWNER to witness the tests/inspections OWNER will advise the bidder in advance whether it intends to be present at any of the inspections.

c) Even if the inspection and tests are fully carried out, the Vendor shall not be absolved from its responsibilities to ensure that the Material(s), raw materials, components and other inputs are supplied strictly to conform and comply with all the requirements of the Contract at all stages, whether during manufacture and fabrication, or at the time of Delivery as on arrival at site and after its erection or start up or consumption, and during the defect liability period. The inspections and tests are merely intended to prima-facie satisfy OWNER that the Material(s) and the parts and components comply with the requirements of the Contract. The Vendor s responsibility shall also not be anywise reduced or discharged because OWNER or OWNER s representative(s) or Inspector(s) shall have examined, commented on the Vendor s drawings or specifications or shall have witnessed the tests or required any chemical or physical or other tests or shall have stamped or approved or certified any Material(s).

d) Although material approved by the Inspector(s), if on testing and inspection after receipt of the Material(s) at the location, any Material(s) are found not to be in strict conformity with the contractual requirements or specifications, OWNER shall have the right to reject the same and hold the Vendor liable for non-performance of the Contract.

21. GUARANTEE/WARRANTY:

a) Materials shall be guaranteed against manufacturing defects, materials,

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workmanship and design for a period of 12 months from the date of commissioning or 18 months from the date of dispatch whichever is later. Warranty for replacement of material / accessories should be provided free of charges at our premises. The above guarantee/warranty will be without prejudice to the certificate of inspection or material receipt note issued by us in respect of the materials.

b) All the materials including components and sub contracted items should be guaranteed by the vendor within the warranty period mentioned above. In the event of any defect in the material, the vendor will replace / repair the material at DAFFPL concerned location at vendor risk and cost on due notice.
c) Alternatively, DAFFPL reserves the right to have the material repaired / replaced at the locations concerned, at the vendors risk, cost and responsibility, in case, vendor does not replace / repair the material.
d) The Vendor shall provide similar warrantee on the parts, components, fittings, accessories etc. so repaired and / or replaced.
e) Vendor shall guarantee that the performance of the EQUIPMENT supplied under the CONTRACT shall be strictly in conformity with the specifications and shall perform the duties specified under the CONTRACT.
f) RISK PURCHASE CLAUSE: We reserve the right to curtail or cancel the order either in full or part thereof if bidder fails to comply with delivery schedule and other terms & conditions of the order. DAFFPL also reserves the right to procure same or similar materials/equipment through other sources at vendor's entire risk, cost and consequences.

22. TEST & PERFORMANCE CERTIFICATES: Bidder shall furnish Material test and Performance Certificates for the materials along with the challans and invoice.

23. PAYMENT TERMS: Generally no payment shall be made for works estimated to cost less than Rs. 50,000/- till the whole of the work shall have been completed. But in case of works estimate to cost more than Rs. 50,000/- the contractor on submitting the bill thereof be entitled to receive a monthly/progressive payment proportion to the part thereof approved and passed by the Engineer-in-Charge, whose certificate of such approval and passing of the sum so payable shall be final and conclusive against the contractor. This payment will be made after making necessary deductions as stipulated elsewhere in the contract document for materials, security deposit or any moneys due to the Owner etc.

STANDARD PAYMENT TERMS FOR WORKS CONTRACTS

The payment terms given below are subjected to the following conditions:

- Monthly progressive payments shall be made towards the work completed as per the payment terms and as per agreed rates, against running account bills submitted by the contractors.

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- **CIVIL**
  - **80% on completed individual item of work.**
  - **20% on completion of all and final acceptance by site-in-charge.**

- **ELECTRICAL**
  - **80% on completed individual item of work including installation, testing & commissioning.**
  - **20% on completion of all and final acceptance by site-in-charge**

- **Mechanical**
  - **Structural Steel Works**
    - ✓ **80% after fabrication, erection and welding**
    - ✓ **20% on completion of all works and final acceptance by site-in-charge**

  - **Painting Works**
    - ✓ **80% after surface preparation, application of primer and application of finish paint.**
    - ✓ **20% after completion of all works and acceptance of site-in-charge**
  - **Piping**
    - ✓ **80% on completion of laying, erection including applicable provision of supports, vents etc., alignment and welding/jointing including completion of examinations/testing as specified.**
    - ✓ **20% after completion of all works and acceptance of site-in-charge.**

24. Only in the event of causes of Force Majeure occurring within the contractual delivery period and if they impede the performance of contract, the delivery dates shall be extended on receipt of application from the bidder / Owner without imposition of penalty. Only those causes which depend on natural calamities, civil wars, fire and national strikes which have duration of more than seven consecutive calendar days are considered the causes of force Majeure. The decision of Owner shall be final and binding on vendor.

25. The Vendor must advise the Owner by a registered letter duly certified by Local Chamber of Commerce or statutory authorities and Owner must advise the Vendor by a letter, the beginning and the end of the delay immediately, but in no case later than within 10 days of the beginning and end of such causes of Force Majeure condition as defined above. Provided further that if the performance in whole or part of any obligation under this contract is prevented or delayed by reason of any such event for period exceeding 60 days either party may at its option terminate the contract.

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26. Repeat Order: DAFFPL reserves the right to place repeat order up to the order quantity within SIX MONTHS from the date of original order on mutual agreement basis.

27. Any reference to the Govt. Acts /Regulations etc. in the Bid Document is only indicative, and it is entirely for the bidder to ascertain the applicable Acts/Regulations.

28. Rejected material lying in Owner premises must be replaced within 60 days from date of final report on rejection of material.

29. RECOVERY OF SUMS DUE: Whenever, any claim against bidder for payment of a sum of money arises out of or under the contract or in any other form, the owner shall be entitled to recover such sums from any sum then due or when at any time thereafter may become due from the vendor under this or any other form and should this sum be not sufficient to cover the recoverable amount of claim(s), the vendor shall pay to DAFFPL on demand the balance remaining due.

30. PATENTS & ROYALTIES: The vendor shall fully indemnify owner and users of materials specified herein/supplied at all times, against any action, claim or demand, costs and expenses, arising from or incurred by reasons of any infringement or alleged infringement of any patent, registered design, trademark or name, copy right or any other protected rights in respect of any materials supplied or any arrangement, system or method of using, fixing or working used by the vendor. In the event of any claim or demand being made or action sought against Owner in respect of any of the aforesaid matter, the vendor shall be notified thereof immediately and the vendor shall at his/its own expense with (if necessary) the assistance of Owner (whose all expense shall be reimbursed by the vendor) conduct all negotiations for the settlement of the same and/or litigation which may arise thereof.

31. LIABILITY CLAUSE: In case where it is necessary for employees or representatives of the Vendor to go upon the premises of owner, vendor agrees to assume the responsibility for the proper conduct of such employees/representatives while on said premises and to comply with all applicable Workmen s Compensation Law and other applicable Government Regulations and Ordinances and all plant rules and regulations particularly in regard to safety precautions and fire hazards. If this order requires vendor to furnish labour at site, such vendors workmen or employees shall under NO circumstances be deemed to be in owner s employment and vendor shall hold himself responsible for any claim or claims which they or their heirs, dependent or personal representatives, may have or make, for damages or compensation for

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anything done or committed to be done, in the course of carrying out the work covered by the purchase order, whether arising at owner s premises or elsewhere and agrees to indemnify the owner against any such claims, if made against the owner and all costs of proceedings, suit or actions which owner may incur or sustain in respect of the same.

32. COMPLIANCE OF REGULATIONS: Vendor warrants that all goods/Materials covered by this order have been produced, sold, dispatched, delivered and furnished in strict compliance with all applicable laws, regulations, labour agreement, working condition and technical codes and statutory requirements as applicable from time to time. The vendor shall ensure compliance with the above and shall indemnify owner against any actions, damages, costs and expenses of any failure to comply as aforesaid.

33. REJECTION, REMOVAL OF REJECTED GOODS AND REPLACEMENT: In case the testing and inspection at any stage by inspectors reveal that the equipment, materials and workmanship do not comply with specification and requirements, the same shall be removed by the vendor at his/its own expense and risk, within the time allowed by the owner. The owner shall be at liberty to dispose off such rejected goods in such manner as he may think appropriate. In the event the vendor fails to remove the rejected goods within the period as aforesaid, all expenses incurred by the owner for such disposal shall be to the account of the vendor. The freight paid by the owner, if any, on the inward journey of the rejected materials shall be reimbursed by the vendor to the owner before the rejected materials are removed by the vendor. The vendor will have to proceed with the replacement of the equipment or part of equipment without claiming any extra payment if so required by the owner. The time taken for replacement in such event will not be added to the contractual delivery period.

34. NON-WAIVER : Failure of the Owner to insist upon any of the terms or conditions incorporated in the Purchase Order or failure or delay to exercise any rights or remedies herein, or by law or failure to properly notify Vendor in the event of breach, or the acceptance of or payment of any goods hereunder or approval of design shall not release the Vendor and shall not be deemed a waiver of any right of the Owner to insist upon the strict performance thereof or of any of its or their rights or remedies as to any such goods regardless of when such goods are shipped, received or accepted nor shall any purported oral modification or revision of the order by DAFFPL act as waiver of the terms hereof. Any waiver to be effective must be in writing. Any lone incident of waiver of the any condition of this agreement by DAFFPL shall not be considered as a continuous waiver or waiver for other condition by DAFFPL.

35. NEW & UNUSED MATERIAL: All the material supplied by the vendor shall be branded new, unused and of recent manufacture.

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36. CANCELLATION:
    a) DAFFPL reserves the right to cancel the contract/purchase order or any part thereof through a written notice to the vendor if –
        i. The vendor fails to comply with the terms of this purchase order/contract.
        ii. The vendor becomes bankrupt or goes into liquidation.
        iii. The vendor fails to deliver the goods on time and/or replace the rejected goods promptly.
        iv. The vendor makes a general assignment for the benefit of creditors.
        v. A receiver is appointed for any of the property owned by the vendor.
        vi. Any other conditions where owners commercial interest get affected.
    b) Upon receipt of the said cancellation notice, the vendor shall discontinue all work on the purchase order matters connected with it. DAFFPL in that event will be entitled to procure the requirement in the open market and recover excess payment over the vendor s agreed price if any, from the vendor and also reserving to itself the right to forfeit the security deposit if any, made by the vendor against the contract. The vendor is aware that the said goods are required by DAFFPL for the ultimate purpose of materials production and that non-delivery may cause loss of production and consequently loss of profit to the DAFFPL. In this-event of DAFFPL exercising the option to claim damages for non delivery other than by way of difference between the market price and the contract price, the vendor shall pay to DAFFPL, fair compensation to be agreed upon between DAFFPL and the vendor. The provision of this clause shall not prejudice the right of DAFFPL from invoking the provisions of price reduction clause mentioned aforesaid.

37. ANTI –COMPETITIVE AGREEMENTS/ABUSE OF DOMINANT POSITION : The Competition Act, 2002 as amended by the Competition (Amendment) Act, 2007 (the Act), prohibits anti- competitive laws and aims at fostering competition and at protecting Indian markets against anti- competitive practices by enterprises. The Act prohibits anti- competitive agreements, abuse of dominant position by enterprises, and regulates combinations (consisting of acquisition, acquiring of control and M&A) wherever such agreements, abuse or combination causes, or is likely to cause, appreciable adverse effect on competition in markets in India. DAFFPL reserves the right to approach the Competition Commission established under the Act of Parliament and file information relating to anti-competitive agreements and abuse of dominant position. If such a situation arises, then Vendors are bound by the decision of the Competitive Commission and also subject to penalty and other provisions of the Competition Act.

38. ASSIGNMENT: The Vendor can / does not have any right to assign his rights and obligations under these general purchase conditions without the prior written approval of DAFFPL.

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39. GOVERNING LAW: These General Purchase Conditions shall be governed by the Laws of India.

40. AMENDMENT: Any amendment to these General Purchase Conditions can be made only in writing and with the mutual consent of the parties to these conditions.

41. The following expressions used in these terms and conditions and in the purchase order shall have the meaning indicated against each of these:
    a) **OWNER,** Client, Purchaser, buyer **:** means DAFFPL
    b) **VENDOR**, tenderer, Bidder, Contractor, Seller, Supplier, manufacturer stated anywhere in the tender document carry the same meaning: It means the person, firm or the Company / Corporation to bidding and shall include its successors and assigns.
    c) **INSPECTOR/ TPIA:** Person/agency deputed by Owner for carrying out inspection, checking/testing of items ordered and for certifying the items conforming to the purchase order specifications..
    d) **GOODS / MATERIALS:** means any of the articles, materials, machinery, equipments, supplies, drawing, data and other property and all services including but not limited to design, delivery, installation, inspection, testing and commissioning specified or required to complete the order.
    e) **SITE / LOCATION:** means any Site where DAFFPL desires to receive materials anywhere in India as mentioned in tender
    f) **CONTRACT**, Order or Purchase Order/CALL-OFF means the agreement for supply of goods/ materials for required quantity between Owner and Vendor, for a fixed period of time on mutually agreed terms and conditions.
    g) The term MR means Material Requisition containing technical requirements and scope of work (technical), GPC means General Purchase Conditions containing commercial terms & conditions, PO means Purchase order issued after award of contract incorporating agreed deviations in MR, ATC means Agreed Terms & Conditions , RFQ means Request For Quotation.
    h) For the purpose of contract, the trade terms FOB, CFR and CIF, DAP shall have the meanings as assigned to them by INCOTERMS 2010 published by ICC, Paris.

42. REFERENCE FOR DOCUMENTATION :

    The number and date of Collective Request for Quotation (CRFQ) must appear on all correspondence before finalization of Contract / Purchase Order.

    After finalization of Contract / Purchase Order: The number and date of Contract /Purchase Order must appear on all correspondence, drawings, invoices, dispatch advices, (including shipping documents if applicable) packing list and on any documents or papers connected with this order.

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43. ARBITRATION

a) Any 'dispute or difference of any nature whatsoever, any claim, cross-claim, counterclaim or set off of the Owner against the Consultant or regarding any right, liability, act, omission or account of any of the parties hereto arising out of or in relation to this agreement shall be refereed to the Sole Arbitration of the nominated Director of the Owner or of some Officer of the Owner who may be nominated by the nominated Director. The consultant will not be entitled to raise any objection to any such arbitrator on the ground that the arbitrator is an officer of the Owner or that he has dealt with the matters to which the contract relates or that in the course of his duties as an Officer of the Owner, he had expressed view on all or any other matters in dispute or difference. In the event of the arbitrator to whom the matter is originally referred being transferred or vacating his office or being unable to act for any reason, the nominated Director as aforesaid at the time of such transfer, vacation of office or inability to act may in the discretion of the nominated Director designate another person to act as arbitrator in accordance with the terms of the agreement to the end and intent that the original Arbitrator shall be entitled to continue the arbitration proceedings notwithstanding his transfer or vacation of office as an officer of the Owner if the nominated Director does not designate another person to act as arbitrator on such transfer, vacation of office or inability of original arbitrator. Such person shall be entitled to proceed with the reference from the point at which it was left by his predecessor. It is also a term of this contract that no person other than the nominated Director of the Owner or a person nominated by such nominated Director as aforesaid shall act as arbitrator hereunder. The award of the arbitrator so appointed shall be final, conclusive and binding on all parties to the agreement subject to the provisions of the Arbitration & Conciliation Act,1996 or any statutory modification or reenactment thereof and the rules made there under for the time being in force shall apply to the arbitration proceedings under this clause.

b) The arbitrator shall have power to order and direct either of the parties to abide by, observe and perform all such directions as the arbitrator may think fit having regard to the matters in difference i.e. dispute, before him. The arbitrator shall have all summary powers and may take such evidence oral and/or documentary, as the arbitrator in his absolute discretion thinks fit and shall be entitled to exercise all powers under the Indian Arbitration & Conciliation Act 1996 including admission of any affidavit as evidence concerning the matter in difference i.e. dispute before him.

c) The parties against whom the arbitration proceedings have been initiated, that is to say, the Respondents in the proceeding, shall be entitled to prefer a cross claim, counter claim or set off before the Arbitrator in respect of any matter in issue arising out of or in relation to the Agreement without seeking a formal reference of arbitration to the nominated Director/officer for such

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counter-claim, or set off and the Arbitrator shall be entitled to consider and deal with the same as if the matters arising therefore has been referred to him originally and deemed to form part of the reference made by the nominated Director/officer.

d) The arbitrator shall be at liberty to appoint, if necessary any accountant or engineering or other technical person to assist him, and to act by the opinion so taken.

e) The arbitrator shall have power to make one or more awards whether interim or otherwise in respect of the dispute and difference and in particular will be entitled to make separate awards in respect of claims of cross claims of the parties.

f) The arbitrator shall be entitled to direct any one of parties to pay the costs to the other party in such manner and to such extent as the arbitrator may in his discretion determine and shall also be entitled to require one or both the parties to deposit funds in such proportion to meet the arbitrators expenses whenever called upon to do so.

g) The parties hereby agree that the courts in the city of Delhi alone shall have jurisdiction to entertain any application or other proceedings in respect of anything arising under this agreement and any award or awards made by the Sole Arbitration hereunder shall be filed (if so required) in the concerned courts in the city of Delhi only.

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1. PROJECT SPECIFICATIONS FOR CIVIL, STRUCTURAL AND OTHER ALLIED WORKS

CLIENT: DELHI AVIATION FUEL FACILITY (P) LIMITED, NEW DELHI

CONSULTANT: SAGA GLOBAL CONSULTANTS, MUMBAI

0	11-09-2018	Issued for Approval				
Rev	**Date**	**Description**	**Prepared**	**Reviewed**	**Approved**	**Client Review**

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1.0 INTRODUCTION

Delhi Aviation Fuel Facility Private Limited (DAFFPL), a Joint Venture comprising Indian Oil Corporation Ltd. (IOCL), Bharat Petroleum Corporation Ltd. (BPCL), and Delhi International Airport (P.) Ltd. (DIAL) are laying a network system for sewage at their existing Fuel Farm facility of Aviation Fuel station, located at Shahabad, Mohammadpur near Indira Gandhi International Airport, New Delhi (IGI Airport). The following facilities are part of scope of work For Sewage treatment plant.

i. Designing of Sewage Treatment Network
ii. Power and Earthing (connected to existing system)
iii. Technical Specifications & BOQ for Tendering Purpose.

2.0 PROJECT DESCRIPTION

2.1 DAFFL is operating and maintaining existing Aviation Fuel Terminal, which caters to supply of Aviation fuel at Indira Gandhi Terminal, New Delhi. A sewage treatment plant is already existing in adjoining area. For buildings in DAFFPL area, which are having toilet facilities like new control Room, existing Administrative Block and PCVO Crew Rest Room, sewage disposal system is being planned. The system will comprise of providing a septic tank. A pipe line connecting the sewage of new control Room, existing Administrative Block shall be first carried to a collection pit and then pumped from this collection pit to Septic tank. Sewage from PCVO Rest room shall be carried to Septic tank. this tank. Sewage from this Septic tank shall be transferred to main sewage treatment plant in DIAL Area through pumping and a suitable pump shall also be provided at top of Septic tank

3.0 BROAD SCOPE OF WORK

The scope of work shall, but not limited to, comprise of following:

i. Construction of septic tank (two compartment) od approx. size 8.2 M X 2.14 M X 2.6-2.14 M depth.
ii. Underground sewage carrying pipes (material of construction UPVC), connecting sewage of individual units and combined units
iii. Providing suitable number of Inspection chambers and collection pits

iv. Providing sewage transfer pump foundations and canopy

v. Dismantling and area development work, if any to facilitate the execution of above mentioned facilities.

3. TECHNICAL SPECIFICATIONS FOR CIVIL, STRUCTURAL AND OTHER ALLIED WORKS

CLIENT: DELHI AVIATION FUEL FACILITY (P) LIMITED, NEW DELHI

CONSULTANT: SAGA GLOBAL CONSULTANTS, MUMBAI

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1.0 GENERAL

1.1 Specifications of materials and workmanship shall be as described in the Central Public Works Department Specifications Vol. I to VI (latest) including latest amendments, unless otherwise specified. These CPWD Specifications shall be deemed to form part of this contract. The Contractor shall procure and maintain copies of the latest CPWD Specifications at site for reference.

1.2 These technical Specifications shall be supplementary to the specifications contained in the CPWD specifications, wherever at variance, these Particular Specifications shall take precedence over the provisions in the CPWD Specifications.

1.3 Site clearing - Site clearing means the cutting of trees, bushes, shrubs etc. and the pulling out of roots and stumps to effect a general cleaning of the site area. All these materials shall be removed from the site area at the Contractor's expenses and responsibility and shall be disposed off as directed by Owner / Consultant. Trees, bushes, roots, stumps and other materials shall not be disposed off by burning within the site boundaries unless the Owner / Consultant permits.

2.0 REFERENCE STANDARDS

2.1 Wherever reference of BIS Specifications/ or BIS Codes of Practice are made in the Specifications / Schedule of Rates or Preambles, reference shall be to the latest edition of BIS (Bureau of Indian Standards).

IS - 109	Ready mixed paint, brushing, priming, plaster to Indian Standard colour No. 631 & 361 white and off-white.
IS - 383	Coarse & Fine aggregates from natural sources for concrete.
IS - 419	Putty, for use on window frames
IS - 427	Distemper, dry, colour as required.
IS - 432	Mild Steel & Medium tensile steel bars.
IS - 456	Code of Practice for Plain and Reinforced Concrete
IS - 459	Corrugated & Semi-corrugated asbestos cement sheets
IS - 515	Natural and Manufactured aggregates for use in mass concrete.
IS - 730	Hook bolts for corrugated sheet roofing
IS - 800	Code of Practice for General Construction in Steel

IS - 814	Covered electrodes for manual metal arc welding of carbon and carbon manganese steel.
IS - 815	Classification coding of covered electrodes for metal arc welding of structural steels.
IS - 816	Metal Arc Welding for General Construction of Mild Steel.
IS - 817	Code of practice for training and testing of metal arc welders.
IS - 883	Code of practice for structural timber in building.
IS - 1038	Steel doors, windows and ventilators
IS - 1079	Hot rolled carbon steel sheets & strips
IS - 1081	Code of practice for fixing and glazing of metal (steel & aluminum) doors, windows and ventilators.
IS - 1161	Steel tubes for structural purposes.
IS - 1285	Wrought aluminum & aluminum alloy extruded round tube and hollow sections
IS - 1361	Steel windows for Industrial Buildings.
IS - 1363	Hexagon head bolts, screws & nuts of product grade C: Part - I Hexagon head bolts (size range M5 to M64)
IS - 1367	Technical supply conditions for threaded steel fasteners
IS - 1566	Hard - Drawn steel wire fabric for concrete reinforcement.
IS - 1786	High strength deformed steel bars & wires for concrete reinforcement.
IS - 2062	Steel for general structural purposes.
IS - 2116	Sand for masonry mortars.
IS - 2212	Code of practice for brickwork.
IS - 2386	Methods of test for aggregates.
IS - 2553	Safety glass: Part - I General purpose.
IS - 2835	Flat transparent sheet glass
IS - 4923	Hollow Steel sections for structural use.
IS - 4925	Concrete batching and mixing plant.
IS - 5410	Cement Paint
IS - 6477	Dimensions for wrought aluminum & aluminum alloys, extruded hollow sections.
IS - 7318	Fusion welding of steel.
IS - 10262	Recommended guidelines for concrete mix design.

3.0 EARTHWORK

3.1 EXCAVATION

3.1.1 Excavation shall be carried out in soil of any nature and consistency, in the presence of water or in the dry, met on the site to the lines, levels and contours shown on the detailed drawings and contractor shall remove all excavated materials to soil heaps on site or transport for use in filling on the site or stack them for reuse as directed by the Owner / Consultant.

3.1.2 Surface dressing shall be carried out on the entire area occupied by the buildings including plinth protection as directed without any extra cost. The depth of excavation shown on the drawings are the depths after surface dressing.

3.1.3 The site around all buildings and structures to a width of 3 meter beyond the edge of plinth protection, ramps, steps, etc. shall be dressed and sloped away from the buildings.

3.1.4 Black cotton soil, and other expansive or unsuitable soils excavated shall not be used for filling in foundations, and plinths of buildings or in other structures including manholes, septic tanks etc. and shall be disposed off within the contract area marked on the drawings, as directed, levelled and neatly dressed.

3.1.5 In case of trenches exceeding 2 meter depth or where soil is soft or slushy, the sides of trenches shall be protected by timbering and shoring. The Contractor shall be responsible to take all necessary steps to prevent the sides of trenches from caving in or collapsing. The extent and type of timbering and shoring shall be as directed by the Owner / Consultant.

3.1.6 Where the excavation is to be carried out below the foundation level of adjacent structure, the precautions to be taken such as under pinning, shoring and strutting etc. shall be determined by Owner / Consultant. No excavation shall be done unless such precautionary measures are carried out as per directions of Owner / Consultant.

3.1.7 Specification for Earth work shall also apply to excavation in rock in general. The excavation in rock shall be done such that extra excavation beyond the required width and depth as shown in drawings is not made. If the excavation done in depth greater than required / ordered. The contractor shall fill the extra excavation with concrete of mix 1:5:10 as the foundation concrete at his own cost.

3.1.8 Contractor shall make all necessary arrangements for dewatering / defiling as required to carry out proper excavation work by bailing or pumping out water, which may accumulate in the excavation pit from any cause / source whatsoever.

3.1.9 Contractor shall provide suitable draining arrangements at his own cost to prevent surface water entering the foundation pits from any source.

3.1.10 The contractor is forbidden to commence the construction of structures or to carry out concreting before Owner / Consultant has inspected, accepted and permitted the excavation bottom.

3.1.11 Excavation in disintegrated rock means rock or Boulders including brickbats which may be quarried or split with crow bars. This will also include laterite arid hard conglomerate.

3.1.12 Excavations in hard rock - meant excavation made in hard rock to be done manually, or by blasting using only explosives and / or pneumatic hammers. In case of blasting, control blasting should be adopted depending on site conditions. For using explosives contractor shall follow all provisions of Indian Explosives Act / Rules 1983, corrected / revised up to date.

3.1.13 In case of hard rock excavation to be carried out using explosives the, contractor shall obtain the written approval in advance.

3.1.14 The measurements for excavations shall be restricted and limited to minimum excavation line as per drawing for payment purposes.

3.2 FILLING

3.2.1 Back filling of excavations in trenches, foundations and elsewhere shall consist of one of the following materials approved by Owner / Consultant

i. Soil
ii. Sand
iii. Moorum
iv. Hard-core
v. Stone / gravel

All backfilling material shall be approved by the Owner / Consultant

3.2.2 Soil filling - Soil material shall be free from rubbish, roots, hard lumps and any other foreign organic material. Filling shall be done in regular horizontal layers each not exceeding 20 Cm. depth.

3.2.3 Back filling around completed foundations, structures, trenches and in plinth shall be done to the lines and levels shown on the drawings.

3.2.4 Back filling around pipes in the trench shall be done after hydrotesting is done.

3.2.5 Back filling around liquid retaining structures shall be done only after leakage testing is completed and approval of Owner / Consultant is obtained.

3.2.6 Sand used for filling under foundation concrete, around foundation and in plinth etc. shall be fine / coarse, strong, clean, free from dust, organic and deleterious matter. The sand filling under foundation shall be rammed with Mech. compactor. Sand material shall be approved by Owner / Consultant.

3.2.7 Moorum for filling, where ordered, shall be obtained from approved pits and quarries which contain siliceous material and natural mixture of clay. Moorum shall not contain any admixture of ordinary earth. Size of moorum shall vary from dust to 10 mm.

3.2.8 Hard-core shall be of broken stone of 90 mm to 10 mm size suitable for providing a dense and compact sub grade. Stones shall be sound, free from flakes, dust and other impurities. Hard core filling shall be spread and levelled in layers, 15 cm thick, watered and well compacted with ramming or with mechanical / hand compacts including hand packing wherever required.

4.0 PLAIN AND REINFORCED CONCRETE WORK

These specifications deal with cement concrete, plain or reinforced, for general use, and covers the requirements for concrete materials, their storage, grading, mix design, strength & quality requirements, pouring at all levels, reinforcements, protection, curing, form work, finishing, painting, admixtures, inserts and other miscellaneous works.

4.1 MATERIALS

4.1.1 Cement: Any of the following cements may be used as required.

IS - 269	Ordinary Portland cement, 33 grade
IS - 8041	Rapid hardening Portland cement
IS - 455	Portland slag cement
IS - 8112	43 Grade ordinary Portland cement
IS - 12330	Sulphate resistant ordinary Portland cement
IS - 12269	53 Grade ordinary port land cement
IS - 6909	Specifications for super Sulphate cement.

4.1.2 Water: Water used for mixing and curing concrete and mortar shall conform to the requirements as laid down in clause 5.4 of IS: 456.

4.1.3 Aggregates: Coarse and fine aggregates for cement concrete plain and reinforced shall conform to the requirements of IS 383 and / or IS 515. Before using, the aggregates shall be tested as per IS: 2386.

Coarse aggregate: Coarse aggregate for all cement concrete work shall be broken or crushed hard stone, black trap stone obtained from approved Quarries or gravel.

Sand: Fine aggregate for concrete work shall be river bed coarse sand from approved sources. Grading of coarse sand shall be within grading zones I, II or III laid down in IS: 383, table 4. If required the aggregates (both fine and coarse) shall have to be thoroughly washed and graded as per direction of Owner / Consultant.

4.2 MIXING

All cement concrete plain or reinforced shall be machine mixed. Mixing by hand may be employed where quantity of concrete involved is small, with the specific prior permission of the Owner / Consultant. 10% extra cement shall be added in case of hand mixing as stipulated in IS-456.

4.3 WATER CEMENT RATIO

Once a mix, including its water-cement ratio, has been determined and specified for use by the Owner / Consultant, that water cement ratio shall be maintained.

4.4 LAYING

Concreting shall be commenced only after the Owner / Consultant has inspected and passed the sub-base / base or the centering, shuttering and reinforcement. Concrete in slab beams, columns, footings etc. shall be laid gently in layers not exceeding 15 cm and shall be properly consolidated by means of approved mechanical vibrators.

4.5 CURING

a. After the concrete has begun to harden, it shall be protected with moist gunny bags, sand or any other material approved by the Owner / Consultant against quick drying. After 24 hours of laying concrete, the surface shall be cured by flooding with water or by covering with wet absorbent materials for 7 days as per the direction of Owner / Consultant.

b. Approved curing compounds may be used in lieu of moist curing with the permission of the Owner / Consultant. Such compounds shall be applied to all exposed surfaces of the concrete as soon as possible after the concrete has set. No extra payment shall be made for the same.

4.6 GRADES OF CONCRETE

4.6.1 Grades of cement concrete shall be as given below:

	Grade Specified	Characteristic compressive strength at 28 days (N/mm^2)
i.	M 7.5	7.5 (75 Kg/cm^2)
ii.	M 10	10 (100 Kg/cm^2)
iii.	M 15	15 (150 Kg/cm^2)
iv.	M 20	20 (200 Kg/cm^2)
v.	M 25	25 (250 Kg/cm^2)
vi.	M 30	30 (300 Kg/cm^2)
vii.	M 35	35 (350 Kg/cm^2)

4.6.2 Grades lower than M 20 shall not be used in reinforced concrete.

4.6.3 M 7.5 grades of concrete may be used for lean concrete bases & simple foundation for masonry walls.

4.6.4 A sieve analysis test of aggregates shall be carried out as and when the source of supply is changed without extra charge notwithstanding the mandatory test required to be carried out as per CPWD specification.

4.6.5 All test in support of mix design shall be maintained as a part of records of the contract. Test cubes for mix design shall be prepared by the contractor under his own arrangements and at his costs, but under the supervision of the Owner / Consultant.

4.7 NOMINAL MIX CONCRETE

4.7.1 All concrete work (P.C.C / R.C.C) shall be with nominal mix concrete unless specified otherwise. The proportions of materials used for concrete of grades M5, M 7.5, M10, M15 and M20 shall be as per following Table.

PROPORTIONS FOR NOMINAL MIX OF CONCRETE

Grade of Concrete	**Total Quantity of Dry Aggregate by Mass per 50 Kg of Cement (as sum of Fine and coarse aggregates), in Kg, Max.**	**Proportion of Fine Aggregate to coarse aggregate (by Mass)**	**Quantity of water per 50 Kg of cement Maximum in liters.**
M 5	800	Generally 1.2 subject to an upper limit of 1:1.5 and a lower limit of 1:2.5	60
M 7.5	625	-do-	45
M 10	480	-do-	34
M 15	350	-do-	25
M 20	250	-do-	30

Notes:

1. The proportions of the fine aggregates should be adjusted from upper limit to lower limit progressively as the grading of the fine aggregates become finer and the maximum size of coarse aggregate becomes larger. Graded coarse aggregate as per IS: 383 may be used.
2. This Table envisages batching by weight. Volume batching when done, the nominal mixes would roughly be 1:3:6, 1:2:4 and 1:1.5:3 for M10, M15 and M20 respectively.

3. For under water concreting the quantity of coarse aggregate, either by volume or mass, shall not be less than 1.5 times not more than twice that of fine aggregates.

4.7.2 The cement content of the mix specified for any nominal mix shall be proportionately increased if the quantity of water in a mix has to be increased to overcome the difficulties of placement and compaction, so that water - cement ratio is not exceeded. In case of vibrated concrete, the limits specified, above may suitably be reduced to avoid segregation.

4.7.3 If the nominal mix concrete made in accordance with the proportion given for a particular grade does not yield the specified strength, such concrete shall be classified as belonging to lower grade. However, if the strength results of test are higher than those specified for the grade in the nominal mix of concrete it shall not be placed in a higher grade.

4.8 DESIGN MIX CONCRETE

4.8.1 Design mix shall be allowed for major works where it is contemplated to be used by installing weigh batch mixing plant as per IS 4925.

At the time of tendering, the contractor, after taking into account the type of aggregates, plant and method of laying he intends to use, shall allow in his tender for the design mix i.e., aggregate / cement and water / cement ratios which he considers will achieve the strength requirements specified, and workability for concrete to be properly finished.

4.8.2 Soon after the contractor gets L.O.I. to commence the work, he shall carry out preliminary tests for design mix on trial mixes proposed by him in design of mix to satisfy the Owner / Consultant that the characteristic strength specified in clause 4.6.1 is obtained. Prior to this may ask the contractor has to get design mix done as per IS 10262 through govt. approved / reputed institute and contractor shall arrange the same at his own cost. The concrete mix to be actually used shall be approved by the Owner / Consultant.

4.8.3 Notwithstanding the above, the following shall be the maximum combined weight of coarse and fine aggregate per 50 kg of cement.

	Grade of Concrete	Maximum weight of fine & coarse aggregates together per 50 kg of cement (for nominal mix only)
i.	M - 10	480 kg
ii.	M - 15	350 kg
iii.	M - 20	250 kg

4.8.4 The workability of concrete produced shall be adequate, so that the concrete can be properly placed and compacted. The slump shall be as follows, when vibrators are used.

i.	Mass concrete in RCC foundations & retaining walls	:	10 to 25 mm
ii.	Beams, slabs & columns simply reinforced	:	25 to 40 mm
iii.	Thin RCC sections or sections with congested reinforcement	:	40 to 50 mm

4.8.5 The minimum consumption of the cement irrespective of design mix shall not be less than the following:

M 20	300 kg/cu m
M 25	300 kg/cu m
M 30	320 kg/cu m
M 35	340 kg/cu m
M 40	360 kg/cu m

4.9 TESTING OF CONCRETE

4.9.1 Testing of concrete, sampling and acceptance criteria shall be in accordance with Clauses 15, 16 & 17 of IS 456.

4.9.2 A slump test shall be taken at each mixer at least once in every fifty batches mixed. Any batch for which a slump test is being made shall not be transferred to the place of laying until the slump test has been completed. Any batch which gives a slump in excess of that described at the time of preliminary tests shall be rejected and removed from the site.

4.9.3 At least six cubes shall be taken for every 30-cu. meter of concrete or part thereof deposited in the work on any day. Three cubes shall be tested for 28 days strength.

4.9.4 If a test for particular work does not meet the specified requirements, the Owner / Consultant, in his absolute discretion may accept the work at a correspondingly reduced rate provided the average strength at 28 days is not less than 85% of the specified strength.

4.9.5 If the results are poorer than 85% of the specified strength, the Owner / Consultant may order further testing of any kind as may be deemed necessary in his opinion, including load tests. The load tests shall be carried on the portion of the structure involving concrete represented by the unsatisfactory works test and such other adjoining elements of a building as the Owner / Consultant may decide.

If the results of the load tests are not satisfactory, the contractor shall at his own cost undertake remedial measures including dismantling and reconstruction according to the directions and to the satisfaction of the Owner / Consultant. If the load test is successful, the Owner / Consultant may exercise his judgment before accepting or rejecting the work and shall still have the power to apply a reduction in rate as herein- stated before, in case the work in question is accepted.

4.10 PROPORTIONING

Mixes of cement concrete shall be as ordered. Where the concrete is specified by grade, it shall be prepared by mixing cement, sand and coarse aggregate by weight as per mix design. In case the concrete is specified as volumetric mix, then dry volume batching shall be done, making proper allowances for dampness in aggregates and bulking in sand. Equivalent volume batching for concrete specified by grade may however be allowed by the Owner / Consultant at his discretion.

4.11 PRE-CAST CONCRETE

The specifications for pre cast concrete will be similar as for the cast in situ concrete. All pre cast work shall be carried out in a yard made for the purpose This yard shall be dry, properly levelled and having a hard and even surface. If the ground is to be used as a soft former of the units, shall be paved with concrete or masonry and provided with a layer of plaster (1:2 proportion) with smooth neat cement finish or a layer of MS sheeting. The casting shall be over suitable vibrating tables or by using form vibrators as per directions of Owner / Consultant.

The yard, lifting equipment, curing tank, finished material storage space etc shall be designed such that the units are not lifted from the mould before 7 (seven) days of curing and can be removed for erection after 28 (Twenty-Eight) days of curing. The moulds shall preferably be of steel or of timber lined with G.I. sheet metal. The yard shall preferably be fenced.

Lifting hooks, wherever necessary or as directed by Owner / Consultant shall be embedded in correct position of the units to facilitate erection, even though they may not be so on the drgs. and shall be burnt off and finished after erection.

Pre-cast concrete units, when ready shall be transported to site by suitable means approved by Owner / Consultant. Care shall be taken to ensure that no damage occurs during transportation. All adjustments, leveling and plumbing shall be done as per, the instructions of the Owner / Consultant. The contractor shall render all help with instruments, materials and staff to the Owner / Consultant for checking the proper erection of the pre-cast units.

After erection and alignment the joints shall be filled with grout or concrete as directed by Owner / Consultant. If shuttering has to be used for supporting the pre-cast unit they shall not be removed until the joints has attained sufficient strength and in no case before 14 (fourteen) days. The joint between pre-cast roof planks shall be pointed with 1:2 (1 cement: 2 sand) mortar where called for in the drgs.

4.12 PROTECTION OF CONCRETE

All concrete shall be protected from damage by rain or by workmen, equipment, overload or any other causes. All edges, corners and projections of concrete members likely to be damaged, shall be protected by means of wooden cover fillets.

4.13 CONSTRUCTION JOINTS

Construction joints shall be made only where shown on the drawings or as approved by the Owner / Consultant.

4.14 SEPARATION JOINT

Separation Joint shall be obtained by using an approved alkathene sheet struck on the surface against which concrete shall be placed. Adequate care should be taken to cause no damage to the sheet.

4.15 DAMP PROOF COURSES

Damp proof course shall consist of cement concrete or RCC of specified proportions and thickness. Surface of brick or stone masonry shall be levelled and prepared before laying the cement concrete.

4.16 SAMPLING OF CONCRETE

Sampling & strength Test of concrete, Acceptance criteria and Inspection & Testing of Structure: This shall be as per the requirements laid down in clause Nos: 15, 16 & 17 of IS: 456.

5.0 STEEL REINFORCEMENT

5.1 STEEL REINFORCEMENT SHALL COMPRISE

i. Mild steel bars conforming to IS: 432 Part-I
ii. TISCON CRS bars.
iii. Hard drawn steel wire fabric conforming to IS: 1566
iv. Cold twisted bars conforming to IS:1786.
v. TMT bars
vi. Fusion bonded Epoxy coated bars conforming to IS: 13620

5.2 All joints in reinforcement shall be lapped adequately to develop the full strength of the reinforcement, unless reinforcement are as per provision of IS: 456 or as per instruction of Owner / Consultant.

Following procedure shall be followed for welding of Tor steel reinforcement bars.

1. Welding of Tor steel reinforcement bars shall be taken up only after specific approval by Owner / Consultant.
2. Lap welding with longitudinal beads shall only be adopted.
3. The thickness of weld bead should be 0.2 x diameter of bar and the length of the longitudinal bead required shall be 10 x diameter of bar, however, the maximum length of continuous bead shall be limited to 5 x diameter of bar with intermediate gap. When welding is done on both sides bead length shall be 5 x diameter of bar on each side.
4. Stripper at closer spacing shall be provided in the lap welded joints as directed by Owner / Consultant.

5.3 M.S. round bars shall be hooked at ends as specified. Ribbed Tor-Steel shall be bent at right angles at ends as indicated or directed.

6.0 FORM WORK

6.1 The shuttering or form work shall conform to the shape, lines and dimensions as shown on the drawings and be so constructed as to remain sufficiently rigid during placing and compacting of the concrete and shall be sufficiently tight to prevent loss of liquid from the concrete. The surface that becomes exposed on the removal of forms shall be examined by Owner / Consultant or his authorised representative before any defects are made good. Work that has sagged or bulged out, or contains honey combing, shall be rejected. All shuttering shall be plywood or steel shuttering.

6.2 The Contractor shall be responsible for sufficiency and adequacy of all form work. Centering and form work shall be approved by the Owner / Consultant, before placing of reinforcement and concreting.

6.3 STRIPPING TIME

Forms shall not be struck until the concrete has reached a strength at least twice the stress to which the concrete may be subjected at the time of removal of form work. The strength referred to shall be that of concrete using the same cement and aggregates, with the same proportions and cured under conditions of temperature and moisture similar to those existing on the work. Where possible, the form work shall be left longer as it would assist the curing.

Note 1 - In normal circumstances and where ordinary Portland Cement is used forms may generally be removed after the expiry of the following periods:

a.	Walls, columns and vertical faces of all structural members		24 to 48 hours as may be decided by the Owner / Consultant
b.	Slabs (props left under)		3 days
c.	Beam soffits (Props left under)		7 days
d.	Removal of props under slabs		
	1.	Spanning upto 4.5 m	7 days
	2.	Spanning over 4.5 m	14 days
e.	Removal of props under beams and arches:		
	1.	Spanning up to 6 m	14 days
	2.	Spanning over 6 m	21 days

For other types of cements, the stripling time recommended for ordinary Portland Cement may be suitably modified.

Note 2 - The number of props left under, their sizes and disposition shall be such as to be able to safely carry the full dead load of the slab, beam or arch as the case may be together with any live load likely to occur during curing or further construction.

7.0 FLYASH BRICK WORK

This specification covers the construction of Fly ash cement brick masonry in foundations, arches, walls, etc. at all elevations. The provision of IS: 2212 shall be complied with unless permitted otherwise.

7.1 BRICKS

All bricks shall be fly ash cement brick conforming to IS:13757-1993 conform to class 50 as designated in CPWD Specifications unless specified otherwise.

7.2 MORTAR

7.2.1 Cement and water shall conform to the requirements laid down for cement concrete work.

7.2.2 Sand for masonry mortar shall be river bed coarse sand conforming to IS: 2116. Maximum quantities of clay, fine dust shall not be more than 5% by weight. Organic impurities shall not exceed the limits laid down in IS: 2116.

7.2.3 Mix of mortar for building brick work shall be as specified in the item of work.

7.2.4 Mixing of mortar shall be done in a mechanical mixer. When quantity involved is small, hand mixing may be permitted by the Owner / Consultant. Any mortar remaining unused for more than 30 minutes after mixing shall be rejected.

7.3 BRICK MASONRY

Brick work shall be built in English bond, unless otherwise specified. The thickness of joints shall be 10 mm + 3 mm. Thickness of joints shall be kept uniform. In case of foundations and manholes etc. Joints upto 15 mm may be accepted.

7.4 HALF BRICK MASONRY

All courses shall be laid with stretchers. Reinforcement comprising 2 Nos. 6 mm dia MS bars shall be provided over the top of the first course and thereafter at every third course.

7.5 LAYING

All iron fixtures, pipe spouts, hold fasts of doors and windows, which are required to be built into the wall shall be embedded in cement concrete blocks 1:2:4 mix (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) 150 mm x 100 mm x 100 mm size, unless otherwise indicated in the item.

7.6 CURING

Brick work shall be protected from rain by suitable covering when the mortar is green. Masonry work shall be kept constantly moist on all faces for a minimum period of seven days.

8.0 UNDER GROUND PIPING

8.1 The pipes shall be centrifugal cast concrete pipes with reinforcement conforming to IS: 458. The class of pipes shall be NP2. The laying and jointing shall be done as per IS: 783.

8.2 The surface and edges of the pipes shall be well defined and their ends shall be perpendicular to longitudinal axis.

8.2.0 LOWERING & LAYING

8.2.1 The pipes shall be lowered when the trench is ready and the bottom has been properly graded as per drawings.

8.2.2 Before lowering, the pipes shall be inspected carefully. Broken or cracked pipe shall be rejected. The inside of the pipe shall be cleaned off from sand, earth or any other matter.

8.2.3 The pipes shall be lowered carefully so as not to disturb the bed and sides of the trench. Heavy pipes shall be lowered with chain pully blocks.

8.2.4 Pipes shall be set according to line and grade. Prior to making joints all surface shall be thoroughly cleaned and prepared as required for the type of joint to be made. Pipe shall be carefully centered so that the completed sewer will have a smooth uniform invert.

8.2.5 BPCL shall be consulted wherever the pipe line crosses a road, railway line trench etc.

8.2.6 Connection to existing sewer shall be done through a manhole generally.

8.2.7 The ends of the pipe line shall be kept sealed to prevent entry of any foreign materials. The seals will be broken before the testing is done.

8.3 JOINTING

8.3.1 The jointing shalt be done as per stipulations of IS: 783.

8.3.2 Concrete pipes shall have collar joints.

8.4 TESTING

8.4.1 The pipeline shall be tested for water tightness of joints. The test shall he carried out from manhole, pipe ends shall be closed and filled with water so that water level is upto the top of the manholes.

8.4.2 The line shall be kept full for 24 hours. Observations shall be taken after one hour interval and if leakage is within 2.5 litres / km/ hr/cm of dia of pipelines, it shall be deemed to have passed the test.

8.4.3 Owner / Consultant may at his own discretion ask the subcontractor to test the laid pipe in sections, in which case the subcontractor will do the same as per the procedure to be decided by the Owner / Consultant without any extra cost to Owner.

8.4.4 In case joints are found to leak, they shall be repaired or redone and test shall be repeated until the joints are approved by Owner / Consultant.

8.4.5 After completion of the test all temporary seals will be removed, the test water shall be drained out / pumped out and the line cleaned properly.

8.4.6 Before commissioning the cleanliness of the pipeline will be checked by Owner / Consultant.

8.4.7 Torch & Mirror Test

8.4.8 In this method of testing, a torch will be held one end of the pipeline inside a manhole and its image through the pipeline will be reflected and seen on a mirror held at the opposite end of the pipeline, inside the next manhole. Any obstruction / debris / major mis-alignment will not give a clear image in which case the pipeline will again be cleaned / rectified and the test re-done.

8.4.9 Ring Test

8.4.10 In this method of testing two steel / wooden rings of suitable thickness and design shall be fixed facing each other at a distance of 2 feet or more. The block of rings shall be inserted from one end of the pipeline, inside manhole and pulled by a rope fixed to the block from the other end of the pipeline inside the next manhole. The rings shall be of dia. 2" less than the inside dia. of pipe under testing. The rope used for pulling the ring block may be inserted in the pipeline by the subcontractor either during construction or afterwards by suitable means. Any obstruction / debris / major misalignment will prevent the ring to pass through the pipeline in which case the pipeline will again be cleaned / rectified and the test redone.

8.5 RESTORATION OF DAMAGED SURFACES AND CLEARING THE SITE

8.5.1 All pavements, structures, pipelines, cables, etc. removed, damaged disturbed during the pipe laying work shall be restored to original conditions.

8.5.2 Surplus excavated soil or rubbish material shall be removed to a place as directed by the Owner / Consultant.

8.6 PAYMENT

8.6.1 Measurement of pipeline work for the purpose of payment shall be taken in running metres of the laid pipe measured along centre line, inclusive of spigot and socket. No extra payment shall be made for providing, laying etc., of fittings like bends, tees, etc. that may be necessary in work. The rate quoted shall be inclusive of excavation, lowering, laying, jointing, testing, cleaning of pipe lines, backfilling and any other operation involved in the pipeline work.

9.0 MS GALVANISED GRATINGS

MS Galvanized gratings shall be made out of M.S. flats and Tor steel round bars of approved pattern and thickness. All joints are welded together to form a perfect mesh.

10.0 FLOORING AND PAVING

10.1 SUB BASE OF FLOOR

10.1.1 The area to be paved shall be divided into suitable panels. Form work shall be provided. The boarding / battens shall be fixed in position with their toe at proper level, giving slope where required. Alternatively base concrete may be deposited in the whole area at a stretch

10.1.2 Before placing the base concrete the sub-base shall be properly wetted and rammed. The concrete of the specified mix shall then be deposited between the forms where provided, thoroughly tamped and the surface, finished level with the top edge of the forms. The surface of base concrete shall be spreader uniformly. The surface shall be finished rough to provide adequate bond for the topping. Two or three hours after concrete has been laid the surface shall be brushed with wire brush to remove any scum or Latinate and swept clean so that coarse aggregate is exposed.

10.2 CEMENT CONCRETE FLOOR FINISH

10.2.1 The surface of base concrete shall be thoroughly cleaned by scrubbing with coir or steel wire brush. Before laying the toping, the surface shall be soaked with water at least for 12 hours and surplus water mopped up immediately before the toping is laid.

10.2.2 The forms shall be fixed over the base concrete dividing into suitable panels. Where glass dividing strips are provided, thickness of glass dividing strips shall be 4 or as indicated. Before placing the concrete toping, neat cement slurry at the rate of 2 kg/sq.m shall be then thoroughly brushed into the base concrete just ahead of the finish. The topping shall then be laid, thoroughly compacted by using screed board/plate vibrator. The surface floated with a wooden float to a fair and even surface shall be left for some time till moisture disappears from it. Junctions with skirting / dado or wall surfaces shall be rounded off using cement mortar 1:2 curing shall be carried out for a minimum of 7 days.

11.0 PLASTERING

11.1 Sand for plastering: shall be 50% fine sand and 50% coarse sand from approved sources.

11.2 Preparation of surface shall be done as per CPWD specifications.

11.3 Cement mortar shall be of the mix as indicated in the items and shall be mixed as specified in the CPWD specifications.

11.4 Joints in walls etc. shall be raked to a depth of 12 mm, brushed clean with wire brushes dusted and thoroughly washed before starting the plaster work.

11.5 The surface shall be thoroughly washed with water cleaned and kept wet to saturation point before plastering is commenced.

11.6 Cement mortar as indicated, shall be firmly applied to the masonry walls in a uniform layer to the thickness specified and will be pressed into the joints. On concrete surfaces rendering shall be dashed to the roughened surface to ensure adequate bond. The surface shall be finished even and smooth. Hectoring wherever required shall be done as per directions of Owner / Consultant. Nothing extra shall be paid on this account.

11.7 All plaster work shall be cured for at least 7 days.

11.8 Integral water proofing compound shall be mixed with cement in the proportion recommended by the manufacturer. Care shall be taken to ensure that the water proofing material gets well and integrally mixed with cement. All other operations are the same as for general plaster work.

11.9 For sand face plaster undercoat of cement plaster 1:4 (1 cement: 4 sand) of thickness not less than 12 mm shall be applied similar to one coat plaster work. Before the under coat hardens the surface shall be scared to provide for the top coat. The top coat also of cement mortar 1:4 shall be applied to a thickness not less than 8 mm and brought to an even surface with a wooden float. The surface shall then be tapped gently with a wooden float lined with cork to retain a coarse surface texture, care being taken that the tapping is even and uniform.

12.0 WHITE & COLOUR WASHING, CEMENT PAINTING PROTECTIVE PAINTING

12.1 WHITE WASHING

12.1.1 Where white wash is indicated, 3 coats of white wash shall be applied. I hi surface shall present a smooth and uniform finish.

12.1.2 White wash shall be prepared from lime slaked at site and mixed and stirred with 5 litres of water for one kg. of unsalted lime to make a thin cream. The cream shall be screened through a clean, coarse cloth and suitable adhesive such as DDL or equivalent as per manufacturer specification. About 1.3 kg of sodium chloride in hot water shall also be added for every 10 kg. of lime for making the coat hard and rule resistant. Indigo shall also be mixed @ 3 gm/Kg of lime. Each, coat shall be allowed to dry before next coat is applied. When dry, the wash should show no sign of cracking. One coat consists of application with brushes in horizontal stroke followed by vertical stroke.

12.2 COLOUR WASHING

12.2.1 Where colour wash is indicated, one coat of white wash and two coats of colour of tints approved by the Owner / Consultant shall be applied. Dados and skirting shall not be white washed, colour washed or distempered or painted.

12.2.2 Only Colour stainer of approved brand not affected by lime, shall be added to colour wash. Indigo (Neel) shall, however, not be added in colour wash.

12.2.3 The colour wash shall be applied as described for white wash. After the surface has been prepared the first primary coat shall be of white wash. Minimum two coats of colour wash shall then be applied. The entire surface shall present a smooth and uniform finish of even tint or shade.

12.3 DISTEMPERING

12.3.1 Where distempering is indicated, two coats of distemper oil emulsion or dry distemper over a priming coat as specified in the item shall be applied. Each coat of distemper shall be approved by the Owner / Consultant before next coat is applied.

12.3.2 Distemper oil emulsion shall be as per IS:248 of approved brand and manufacture. The distemper shall be diluted with water or a prescribed thinner in the proportion of 4 parts of paste by weight to one part of cold water or in the proportion specified by the manufacturer, which shall be invariably followed.

12.3.3 The surface to be distempered shall be cleaned of dust, dirt, chalking and other foreign matter. All cracks, holes and surface defects shall be repaired with gypsum to give a smooth surface, and papered and wiped clean. The surface shall then be rubbed down again with sand paper and made smooth. The surface thus prepared shall be given a coat of alkali resistant, priming paint conforming to IS: 109, or any other primer as specified by the manufacturer and allowed to dry at least for 48 hours.

12.3.4 Dry distemper shall be of approved make and shade conforming to IS 427 and shall be prepared as per manufacturer's specification. The surface to be distempered shall be cleaned of dust, dirt, chalking and other foreign matter. All cracks, holes and surface defects shall be repaired with gypsum to give a smooth surface, and papered and wiped clean. The surface shall then be rubbed down again with sand paper and made smooth. The surface thus prepared shall be given a coat of alkali resistant, priming paint conforming to IS:109, or any other primer as specified by the manufacturer and allowed to dry at least for 48 hours.

12.3.5 After the primer coat has dried for at least 48 hours, the surface shall be lightly sand papered to make it smooth for receiving the distemper, taking care not to rub cut the priming coat and then dusted off. Prepared distemper shall then be applied with brushes in horizontal strokes followed immediately by vertical ones which together constitute one coat.

12.3.6 Subsequent coats shall be applied in the same way, with time intervals of at least 24 hours between consecutive coats.

12.3.7 A uniform finished surface without patches, brush marks, or distemper drops, shall be obtained.

12.4 CEMENT PAINTING

12.4.1 Cement paint: Cement paint shall comply with IS:5410 specification for cement paint, of colour as required.

12.4.2 Where shown on drawings for external surfaces of sand faced plaster, or any other surface, two coats of cement paint shall be applied of tint and shade as approved by the Owner / Consultant.

12.4.3 The surfaces shall be prepared as specified for white washing. Before applying cement paint the surface shall be thoroughly wetted to control surface suction. The surface shall be moist but not dripping wet, when the paint is applied. Not less than 24 hours shall be allowed between the two coats. In hot weather the first coat shall be slightly moistened before applying the second coat.

12.4.4 On external plastered surfaces, sand faced or plain plastered and concrete surfaces, cement paint shall be vigorously scrubbed on to work the paint into the voids and provide a continuous paint film free from pin holes and other openings. Curing shall be done between the coats and for at least 2 days following the final coat.

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1			2	3	4	5	6	7	8	9	10
1.0			**CONCRETING WORK**								
	1.1		**Coarse Aggregate for concrete and filters**								
		1.1.1	Particle Size & Shape (Sieve analysis, flakiness index, elongation index including visual inspection.	Sieves (confirming to IS-460-1962), balance, Oven, Thickness gauge, Length Gauge, Metal Scoop etc	B	Physical	one test per 100 cum/ change of source whichever is earlier	IS: 2386 Part-I, (for test procedure), IS:383 (for permissible value)/TS	SR/LB		Results should be as per request of design mix subjected to verification within the limits specified in relevant IS code Check by OWNER / CONSULTANT.
		1.1.2	Deleterious materials & organic impurities	Balance, Sieve (confirming to IS-460 1962) etc.	B	Lab analysis & Physical	To be done twice per source. Once at the starting, another in the middle	IS: 2386 Part-II, (for test procedure), IS:383 (for permissible value)/TS	SR/LB/ Test Report		Experts opinion regarding suitability of the aggregates shall be obtained from any specialist institute, Results will be reported nearest to 0.1% for clay lumps Check by OWNER / CONSULTANT
		1.1.3	Determination of specific gravity , water absorbtion, bulk density and voids	Balance, Sieve (confirming to IS-460 1962) etc.	B	Physical	Once in twelve weeks/ 500 cum or change of source whichever is earlier	IS: 2386 Part-III, (for test procedure), IS:383 (for permissible value)/TS	SR/LB/ Test Report		These tests shall be carried out while establishing design mix & results be intimated. OWNER / CONSULTANT
		1.1.4	Determination of Crushing value, Determination of impact value	Standard Apparatus for these test shall be used	A	Physical	To be done twice per source. Once at the starting, another in the middle	IS: 2386 Part-IV, (for test procedure), IS:383 (for permissible value)/TS	SR/LB/ Test Report		These tests shall be carried out while establishing design mix & results be intimated. OWNER / CONSULTANT to check
		1.1.5	Moisture content	Balance, Sieve(confirming to IS-460- 1962) and Oven etc.	B	Physical	Once for each stack of 100 Cu.M. or part there of Except during monsoon when this has to be done every day before start of concreting	IS:2386 Part-III IS : 456 IS : 383/TS	SR/LB		Accordingly water content of the concrete will be adjusted. These tests shall be carried out while establishing design mix & results be intimated. OWNER / CONSULTANT to check
		1.1.6	Soundness	Reagents (sodium Sulphate or Magnesium Sulphate)	B	Chemical/ Physical	To be done twice per source. Once at the starting, another in the middle.	IS: 2386 Part-V, (for test procedure), IS:383 (for permissible value)/TS	SR/LB/ Test Report		These tests shall be carried out while establishing design mix & results be intimated. OWNER / CONSULTANT to check
	1.2		**Fine aggregate**								
		1.2.1	Bulkage, bulk density, surface moisture & water absorption	As per IS Code	B	Physical	Bulkage & surface moisture to be done everyday before starting the work. Bulk density & water absorption to be done once in twelve weeks/ 500 cum or change of source whichever is earlier	IS: 2386 (Part III), IS:383/ TS	SR/LB/TR		Volume of sand and weight of water shall be adjusted as per bulk and moisture content OWNER / CONSULTANT to check
		1.2.2	Mortar making properties	As per IS Code	B	Physical	Once per source & one for every change of source	IS: 2386 (Part VI), IS:383/ TS	SR/LB/TR		should be as per requirement of design mix OWNER / CONSULTANT to check
		1.2.3	Silt, Clay content and organic impurities and deleterious materials	Balance, Sieve (confirming to IS-460 1962) etc.	B	Physical	To be done twice per source. Once at the starting, another in the middle	IS: 2386 Part-II, (for test procedure), IS:383 (for permissible value)/ TS	SR/LB/ Test Report		should be as per requirement of design mix OWNER / CONSULTANT to check

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		1.2.4	Sieve Analysis, particle shape & size	set of sieves	B	Physical	one test per 100 cum/ change of source whichever is earlier	IS: 2386 (Part-I), IS:383/ TS		SR/LB/TR	Should be as per requirement of design mix subject to variation specified in relevant IS codes. OWNER / CONSULTANT to check
		1.2.5	Soundness	Reagents (sodium Sulphate or Magnesium Sulphate)	B	Chemical/ Physical	To be done twice per source. Once at the starting, another in the middle	IS: 2386 Part-V, (for test procedure), IS:383 (for permissible value)		SR/LB/ Test Report	These tests shall be carried out while establishing design mix & results be intimated. OWNER / CONSULTANT to check
	1.3		**Water**								
		1.3.1	Tests for PH Value	PH meter / PH paper (to be recorded at site)	B	Testing at lab	One per month for each source	IS:3025, IS:456		SR/LB/TR	do
	1.4		**CEMENT (review of manufacturers test certicate for each consignment brought at site with the information to OWNER / CONSULTANT.**								
		1.4.1	a) Ensure that cement is stored in weather tight covered storage on raised platform.		B	Visual	100% covered storage	Refer OWNER / CONSULTANT tech Spec		SR/LB	OWNER / CONSULTANT site engineer to check. Manufacturers test certificate to be submitted by the contractor
		1.4.2	Fineness	As required	B	Physical	One per 200 MT	IS: 4031/ 1489/269/455/TS		SR/LB	do
		1.4.3	Initial & Final Setting time	As required	B	Physical	do	IS:4031/TS		SR/LB	do
		1.4.4	Soundness	As required	B	Physical	do	IS:4031/TS		SR/LB	do
		1.4.5	Specifiv Gravity	As required	B	Physical	do	IS:4031/TS		SR/LB	do
		1.4.6	Compressive Strength	As required	B	Physical	do	IS:4031/TS		SR/LB	do
	1.5		**STAGING, SHUTTERING AND FORMS**								
		1.5.1	Materials and accessories	As required	B	Visual	100%	IS 4014		SR	proper care should be taken in order to combat corrosion. Proper care should be taken while cleaning, moving and stacking the scafolds. It should be ensured that they are free from warped, broken or damaged edges or uneven surface before putting them on works.Cleaning and oiling is to be done.to check for loose connections if any Check by OWNER / CONSULTANT
		1.5.2	Steel plate / Plywood for concrete shuttering work	As required	B	Visual	100%	IS 4990:1993, IS 1734; (Part 1 -11)/TS			Relevant documents & recommended method of use & loading etc. to be checked by OWNER / CONSULTANT
		1.5.3	Durability, Strength & Soundness of staging, joists, shuttering and scaffolding	As required	B	Visual	Once	As per technical specification, manufacturer's spec.and IS: 3696,4014, 4990		SR	To be checked by OWNER / CONSULTANT before & after placement of concrete
		1.5.4	Connection between individual scaffolding units and safe slenderness ratio. Two independent safety measures against collapse	As required	B	Visual	Fortnightly	As per relevant IS Codes		SR	OWNER / CONSULTANT site engineer to check

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		1.5.5	Alignment/Shape	As required	B	Measurement	Each member & before each lift of shuttering or before next stage	As per approved drawings		SR/LB	length,breadth,depth,shape, level, plumb line to be checked. Diagonal bracings are to be checked.
		1.5.6	Check form's seam marks and water tightness	As required	B	Physical	Random	As per approved drawings		SR/LB	OWNER / CONSULTANT site engineer to check
	1.6	1.6.1	**Mix Design**	As required	B	Physical	Once for every change in mix materials source.	IS: 516 & IS:456, IS:10262/OWNER / CONSULTANT Tech. Spec.		Mix Design Report	Design mix is to be carried out at any approved lab.
		1.6.2	Trial mix (Cubes compressive strength)of the Mix Design	As required	A	Physical	Min. 3 Trial Mixes with admixtures (if any) and Without admixtures	IS: 516 & IS:456, IS:10262/ OWNER / CONSULTANT Tech. Spec.		SR/LB/ Test Report	OWNER / CONSULTANT will conduct the trial mixes Mixing shall be in OWNER / CONSULTANT approved batching plant/ weigh batcher.
		1.6.3	Crushing strength of trial mix cubes	As required for 7 & 28 days strength test	A	Physical	As per IS 456	IS: 516 & IS:456, IS:10262/ OWNER / CONSULTANT Tech. Spec.		SR/LB	witness by OWNER / CONSULTANT
	1.7		**Concrete conveying, placing and Compaction**								
		1.7.1	Mixing of concrete	mixing of concrete shall be done in a approved mixer / weigh batcher / batching plant such as to produce a homogenous mix	B	Physical	To be calibrated at the time of starting and as desired by Engineer-in - charge	Review of calibration chart/ Certificate, IS 456/ TS			time of mixing will be as given in Technical specification / IS 456 Min. time of mixing should be 2 minutes for mixer capacity 2 cum or less Min. time of mixing should be 3 minutes or as recommended by by the mixer manufacturer for mixer capacity above 2 cum
		1.7.2	Handling and Conveying	Buckets , Chutes, belt conveyer etc	B	Physical	100%	as per Tech. Spcfn./construction/erection methodology/ IS 457		SR	Technical specification is to be followed.
		1.7.3	Placement of concrete	Visual	B	Physical	100%	as per construction/erection methodology as per tech.specs		SR	no concrete shall be placed until the place of deposite has been thoroughly inspected and accepted, Check by OWNER / CONSULTANT
		1.7.4	Compacting	As required	B	Physical	100%	Check for segregation as per IS 456 & TS		SR	Bleeding or segregation etc. is to be avoided as far as possible. Accumulated water is to be removed and shall not be covered with concrete, or dry concrete Check by OWNER / CONSULTANT

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1			2	3	4	5	6	7	8	9	10
		1.7.5	Curing	As required minimum 7 days	B	Physical	100%	Check for period of curing as per IS 456 & TS		SR	Exposed concrete surface shall be protected against heating and drying for atleast 72 hrs after placement. Check by OWNER / CONSULTANT
	1.8		**Tests on Green Concrete**								
		1.8.1	Workability :- Slump test	Standard apparatus for different method used for measuring workability, slump cone	B	Physical	One sample every 2 hrs. from every mixing plant/ IS 456	IS:456, IS 1199-1959 & OWNER / CONSULTANT Tech. Spec.		SR/LB/TR	Slump test for medium & high workability OWNER / CONSULTANT site engineer to check
		1.8.2	Crushing strength (works Tests cubes)	As required for 7 & 28 days	A	Physical	As per IS 456	IS:516, IS:456, OWNER / CONSULTANT Tech. Spec.		SR/LB/ Test Report	OWNER / CONSULTANT site engineer to do the test.
		1.8.3	Water cement ratio(Cement Content And Water Content)	As required	B	Physical	At random at the time of batching.	As per IS:1199 and approved design mix.		SR/LB	As per mix design OWNER / CONSULTANT site engineer to check
		1.8.4	Check for cement content		B	Physical	At random at the time of batching.	As per IS:3026, IS: 456, approved design mix & technical specification.		SR/LB	do
		1.8.5	Admixtures for Concrete (if any)	As per IS : 9103	B	Testing	100%	IS:456, appd. Design mix & technical specification		Test Report	Admixture of appd. Brand and tested quality shall be used.Manufacturers TC required.OWNER / CONSULTANT site engineer to check
		1.8.6	Visual examination of finished structure	As required	B	Visual	100%	As per Tech. Specification./App d. Drg./IS-456		-do-	OWNER / CONSULTANT to check
		1.8.7	Dimensions	do	B	Measurement	100%	As per Tech. Specification./App d. Drg./IS-456		do	OWNER / CONSULTANT to check
	1.9		**TEST/CHECK ON RCC STRUCTURE IN HARDENED CONDITIONS:**								
		1.9.1	Ultrasonic Pulse Velocity Test	for critical foundations	A	NDT	100%	IS: 13311 Part- I and Tech. Specification/ IS 456		Test Report	Shall be performed by qualified persons/institution with calibrated equipments in presence of OWNER / CONSULTANT, if there is any doubt in crushing stregth and on specific instruction
		1.9.2	Load Test , Core test & Rebound Hammer	As required	A	Test	As required by OWNER / CONSULTANT Engineer.	As per Technical specification and IS:456-2000		Test Report	The test shall be carried out only in case of doubt regarding grade & quality of concrete.
2.0			**Reinforcement Steel**								
	2.1		Physical and Chemical Properties as per relevant IS codes	As required/ agreed	B	Review of TCs	In 100 MT or part thereof	IS 1786/ 456/ TS		MTC	Approved brands are SAIL/TATA TISCON/ RINL/IISCO OWNER / CONSULTANT to check

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QUALITY ASSURANCE PLAN - CIVIL

REV.	DATE
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Sl. No.			Activity and Operation	Characteristics / Instruments	Class of Check	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Approved By / Format of Record	Remarks / Precautions
1			2	3	4	5	6	7	8	9	10
	2.2		Tolerance	As required/agreed	C	Physical	At random	IS:1786		SR/LB	To be checked at site
	2.3		Freedom from defects	As required/ agreed	C	Visual	Random before and during placement	As per technical specifications & IS: 468		SR	Any of the bars selected for use shall be free from cracks, surface flaws, laminations and rough, jagged and imperfect edges.Steel issued should be free from excessive rust. To be stored diameter wise in such a place so as to permit easy approach for inspection & identification. It should be cleaned of excessive rust before use.R/f will be tied with annealed wire. Water accumulation & distortion of r/f are to be avoided. To be checked by OWNER / CONSULTANT
	2.4		Placement	As required/ agreed	B	Visual	100%	As per approved drawings and approved Bar Bending schedule/ IS 456/ TS		SR/LB/ Pour card	OWNER / CONSULTANT Engineer to check as per Bar Bending Schedule (BBS) and as per relevant codal provision
	2.5		Cutting tolerance	As required/ agreed	B	Physical Measurement	100%	Approved drawings & check list.		SR	Tolerance as per specifications
3.0			**Grout**								
	3.1		Grouting Pressure	Calibrated Pressure Gauge	B	Physical	At random	Approved Drwaing		SR/LB	To be checked at site by OWNER / CONSULTANT
	3.2		Composition of Grout	NIL	B	Verification of MTC	Each lot/Batch	As per Technical Specification		SR/LB	To be checked at site by OWNER / CONSULTANT
	3.3		Compressive strength (7 & 28 days)	As required	A	Physical	6 cubes for every grout at the time of each grouting	As per Technical specification		SR/LB	To be checked at site by OWNER / CONSULTANT
4.0			**Expansion Joints (Test Certificate of Manufacturer & Inspection agency is to be reviewed before placement)**								
	4.1		Check of type & location of installation and release for concreting	NIL	B	Visual	100%	As per Technical Specification		MTC	To be checked at site by OWNER / CONSULTANT
5.0			**Brick Masonry, Sheeting & allied works**								
	5.1		**Test on Bricks**								
		5.1.1	Soundness	As required	C	Physical	As per relevant IS Code/ One Sample for 10,000 Nos. or part thereof	IS: 1077, IS: 3495, IS:2691, Tech. Specification		SR/LB	To be checked at site by OWNER / CONSULTANT as per frequency stipulated in specification & guideline.
		5.1.2	Colour	-	C	Visual	One for each stack	do		do	Deep cherry red copper colour
		5.1.3	Compressive strength	As required	B	Physical	As per relevant IS Code/ One Sample for 10,000 Nos. or part thereof	IS: 1077, IS: 3495 (part I), IS:2891, Tech. Specification		do	To be checked at site by OWNER / CONSULTANT as per frequency stipulated in specification & guideline.
		5.1.4	Water Absorption	As required	B	Physical	As per relevant IS Code/ One Sample for 10,000 Nos. or part thereof	IS: 1077, IS: 3496 (part I), IS:2891, Tech.		do	do
		5.1.5	Visual & Dimension	Visual & Measurement tape	B	Visual & Measurement	Random	IS: 1077 & tech. Spcfn.		do	do

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Sl. No.			Activity and Operation	Characteristics / Instruments	Class of Check	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Approved By / Format of Record	Remarks / Precautions
1			2	3	4	5	6	7	8	9	10
		5.1.6	Warpage	Straight edge & scale	B	Measurement	Per 10000 Nos.	IS: 1077		do	do
	5.2		**Sand (masonary work & road works)**								
		5.2.1	Silt, Clay content and organic impurities	As per IS Code	B	Physical	Once per source & for on every change of source	IS: 2386 Part-II, IS:383 /TS		SR/LB/TR	OWNER / CONSULTANT to check
		5.2.2	Grading Of Sand	IS Sieves	B	Physical	once for 100 cum or part thereof or change of source whichever is earlier.	IS 2116/ IS 383/ TS			OWNER / CONSULTANT to check
		5.2.3	Determination of specific gravity and water absorbtion, & Bulk density	Balance, Sieve (confirming to IS-460 1962) etc.	B	Physical	do	IS: 2386 Part-III, (for test procedure), IS:383 (for permissible value)		SR/LB/ Test Report	do
	5.3		**Masonry construction**								
		5.3.1	Workmanship	---	B	Visual/ Physical	All work	As per Spec And IS 2212 for brick works			OWNER / CONSULTANT to check
		5.3.2	Laying	Trovel, Square, Plumb bob etc	B	Physical	All work	As per Spec And Clause no 11.0 of IS 2212 for brick works			OWNER / CONSULTANT to check
		5.3.3	Verticality and Alignment of Plumb	Plumb bob	B	Physical	All work	IS 2212 and Tech Spec			OWNER / CONSULTANT to check
6.0			**BOUGHT OUT ITEMS - BOI**								
	6.1		Bought out items to be procured form the manufacturers acceptable to OWNER / CONSULTANT Paver Block etc.	As required / agreed	B	Verification of MTC / Testing / review	100%	OWNER / CONSULTANT tech spec. / BOQ. List of all BOI to be submitted for approval along with proposed vendors		Relevant documents / TC	OWNER / CONSULTANT to check
7.0			**HDPE PIPES as per T.S.**								

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1	2	3	4	5	6	7	8	9	10

LEGEND:

Legend to be used: Class # : A = Critical, B = Major, C = Minor; SR, TR, MfrTC

SR = Site Register , **TR**= Test Report , **Mfr TC** = Manufacturer's Test Certificate, duly correlated

This document shall be read in conjunction with OWNER / CONSULTANT Tech. Specifications, BOQ & Drawings.

LIGHTING SYSTEM SPECIFICATION

CLIENT: DELHI AVIATION FUEL FACILITY (P) LIMITED, NEW DELHI

CONSULTANT: SAGA GLOBAL CONSULTANTS, MUMBAI

0	04-10-2018	Issued for Approval	PBS	PBS	SKJ	
Rev	**Date**	**Description**	**Prepared**	**Reviewed**	**Approved**	**Client Review**

INDEX

ANNEXURES

Annexure No.	Description
I	DOCUMENTATION FOR LIGHTING FIXTURES AND ACCESSORIES

1.0 GENERAL

This specification covers the general description of design, manufacture and construction features, testing, supply, installation and commissioning of the illumination system equipment required to be provided by the bidder. All lighting fixtures of the plant shall be LED.

2.0 CODES AND STANDARDS

2.1 All standards and codes of practice referred to herein shall be the latest edition including all applicable official amendments & revisions as on date of bid opening. In case of conflict between this specification and those (IS codes, standards etc.) referred to herein, the former shall prevail. All work shall be carried out as per the following standards & codes.

2.2 Lighting Fixtures and Accessories

IS:1913	General and safety requirements for luminaries.
IS:2148	Flame proof enclosures of electrical apparatus.
IS:418	Tungsten filament general service electric lamps.
IS:1258	Bayonet lamp holders.
IS:1534	Ballast for fluorescent lamps.
IS:1569	Capacitors for use in tubular fluorescent, high pressure mercury vapour and low pressure sodium vapour discharge lamp circuit.
IS:1777	Industrial luminaire with metal reflectors.
IS:2149	Luminaire for Street lighting.
IS:2215	Starters for fluorescent lamps.
IS:2418	Tubular fluorescent lamps for general lighting services.
IS:3323	Bi-pin lamp holders for tubular fluorescent lamps.
IS:3324	Holders for starters for tubular fluorescent lamps.
IS: 3646	Calculation of coefficient of utilization
IS: 4012	Dust proof electric lighting fittings
IS:4013	Dust-tight electric lighting fittings.
IS:6616	Ballasts for high pressure mercury vapour lamps.
IS: 6665	Code of practice for industrial lighting
IS:8224	Electric Lighting fittings for Division 2 areas.
IS:9900	High-pressure mercury vapour lamps.

IS:9974	High pressure Sodium vapour lamps.
IS:10276	Edison screw lamp holders.
IS:10322	Luminaires for street lighting
IS:13021	AC Supplied Electronic Ballasts for tubular fluorescent lamps.
OISD: 244	Storage & Handling of petroleum products at depots and terminals (Draft-3 2013)

2.3 Lighting Panels, Switch-boxes, Receptacles and Junction Boxes

IS:2147	Degree of protection provided by enclosures for low-voltage switchgear and control gear.
IS:1293	Plugs & socket outlets of rated voltage upto and Including 250volts & rated current upto and including 16 Amps.
IS: 2551	Danger notice plates.
IS:13947	Low voltage switchgear and control gear
IS: 3854	Switches for domestic and similar purposes.
IS: 6875	Control switches (switching devices for control and auxiliary circuits including contactor relays) for voltages upto and including 1000 V AC and 1200 V DC.
IS: 13703	Low voltage fuses for voltages not exceeding 1000V AC or 1500 V DC.

2.4 Conduits, Pipes and Accessories

IS:2667	Fittings for rigid steel conduit for electrical wiring.
IS:3837	Accessories for rigid steel conduits for electrical wiring.
IS:9537	Conduits for electrical installations.Conduits, Pipes and Accessories
IS:2667	Fittings for rigid steel conduit for electrical wiring.
IS:3837	Accessories for rigid steel conduits for electrical wiring.
IS:9537	Conduits for electrical installations.

2.5 Lighting Wires / Cables

IS:694	PVC insulated cables for working voltages upto & including 1100 V
IS:3961	Recommended current ratings for cables. (PVC Insulated and PVC sheathed heavy duty cables and light duty cables).
IS:8130	Conductors for insulated electric cables and flexible cords.
IS:10810	Methods of tests for cables.

2.6 Electrical Installation Practices & Miscellaneous

IS:1944	Code of practice for lighting of public thorough fare
IS:3646	Code of practice for interior illumination.
IS:5572	Classification of Hazardous areas (other than Mines) having flammable gases and Vapours for electrical installation
IS:6665	Code of practice for industrial lighting.
IS:5	Colour for ready mixed paints & enamels.
IS:280	Mild steel wires for general engineering purposes.
IS:374	Electric ceiling type fans & regulators.
IS:732	Code of practice for electrical wiring installations.
IS:1255	Code of practice for installation and maintenance of power cables Upto and including 11 kv rating.
IS:2062	Steel for general structural purposes
IS:2629	Recommended practice for hot-dip galvanizing of iron and steel.
IS:2633	Methods for testing uniformity of coating of zinc coated articles.
IS:2713	Tubular steel poles for overhead power lines.
IS:3043	Code of practice for earthing
IS:5216	Guide for safety procedures and practices in electrical work.
IS:5571	Guide for selection of electrical equipments for hazardous areas.
BS:6121	Mechanical cable glands

3.0 AMBIENT CONDITIONS

Equipments shall be suitable for operating in humid & corrosive atmosphere found in petrochemical plants. Service conditions shall be defined as

- Maximum ambient temperature: 39 °C.
- Minimum ambient temperature: 5 °C.
- Relative humidity: 73-84 %.
- Wind speed: 0.194 - 0.69 m/sec
- Elevation 29 mtr above MSL

4.0 LIGHTING SYSTEM DESCRIPTION

4.1 LED Lighting System

LED lighting system 415 V, 3 Phase, 4 wire, will be fed from the lighting distribution boards (LDBs) which in turn will be fed from MLDB / ELDB.

4.2 Design Philosophy

1. A comprehensive illumination system shall be provided.
2. All lighting system shall be automatically controlled by synchronous timer. Provision to bypass the timer shall be provided in the board for manual control.
3. The system shall include lighting distribution boards, lighting fixtures, junction boxes, receptacles, switch boards, lighting poles, conduits, cables and wires, etc. The system shall cover all interior and exterior lighting such as area lighting, including Transformer & DG yard etc. The constructional features of lighting distribution boards shall be similar to AC/DC distribution boards described in chapter of LT Switchgear. Outgoing circuits in Lighting Distribution Boards shall be provided with MCBs of adequate ratings.
4. The illumination system shall be designed on the basis of best engineering practice and shall ensure uniform, reliable, aesthetically pleasing and glare free illumination. The lighting fixtures shall be designed for minimum glare. The design shall prevent glare/luminous patch seen on VDU/ Large video screens, when viewed from an angle. The finish of the fixtures shall be such that no bright spots are produced either by direct light source or by reflection. The diffusers/ louvers used in fluorescent fixtures shall be made of impact resistant polystyrene sheet and shall have no yellowing property over a prolonged period. The Lux levels to be adopted for various area are indicated at Annexure – A.
5. Apart from maintenance factor as given below, Temperature correction factor shall be considered in the lighting design for fluorescent fixtures located in non air conditioned area.

a. Air conditioned area: 0.8
b. Non Air conditioned and other indoor area: 0.7
c. Dust prone indoor areas and outdoor areas: 0.6

6. All outdoor fixtures shall be weather proof/flame proof as the case may be.
7. All lighting fixtures & control gears shall be powder coated.
8. Wires of different phase shall normally run in separate conduit. For areas illuminated by more than one circuit, the adjacent circuits shall be from different phases.
9. Power supply shall be fed from suitable number of conveniently located lighting distribution boards (LDB). AC lighting supply shall be isolated from main supply by lighting transformers of max. rating of 300KVA and fault level restricted to 10 kA at Lighting Distribution Boards. Minimum 2 ways shall be kept as spare feeders in the lighting distribution boards.
10. Lighting transformer shall be 415 V / 415 V, AN cooling, 4% impedance. Vector group shall be Dyn11.offload tap switch/link of ±5% in steps of 2.5% tapping full capacity. Class of insulation shall be class F and maximum temperature rise shall be 90 ºC over ambient temperature of 50 ºC. The neutral of the transformer shall be solidly earthed and brought through separate earth bus. Noise level shall be as per NEMA standard (50 dB for 0 - 50 KVA and 55 dB for 51 - 150 KVA)
11. Lighting distribution boards shall be constructed out of 2 mm thick CRCA sheet steel. The door shall be hinged and the panel shall be gasketted to achieve specified degree of protection. The panel shall be provided with terminal blocks for incoming and outgoing circuits, earthing terminals, removable gland plates at bottom and canopy shall be provided with slope towards the rear side of the panel. Wiring inside the panel shall be carried out with 1100 V grade PVC insulated stranded copper wires of adequate size. Terminal blocks shall be 750 V grade, clip-on stud type, moulded in melamine and shrouded.

All MCBs / Isolators / Switches / Contactors etc. shall be mounted inside the board and a fibre glass sheet shall be provided inside the main door such that the operating knobs of MCBs etc., shall project out of it for safe operation against accidental contact. MCB's shall be current limiting type with magnetic and thermal release suitable for manual closing and automatic tripping under fault condition with short circuit interrupting capacity of 10 kA rms. Isolators of AC lighting boards shall be of TPN, continuous duty, load make-break type and fuses shall be of HRC plug in type.

Synchronous timers shall be quartz controlled electronic type, complete with rechargeable nickel cadmium cell, 24 hours range day dial, NO / NC contacts etc. and suitable for operation on 240V AC supply. The exterior side of panel, shall be powder coated with smoke grey, shade RAL9002 and the interior side of panel, shall be white.

Lighting boards shall have IP55 degree of protection in general. However, Lighting boards located in flameproof areas shall have IP65 degree of protection.

Ladder approaches shall be provided for maintaining the fixtures wherever applicable.

12. 16 A, 240 V AC industrial type receptacles shall be provided in the following areas:

- These receptacles shall be energized from lighting panel. Maximum three receptacles shall be connected in one circuit.
- 10A, 24V AC receptacles with IP55 DOP shall be provided in the following areas.
- Three nos in each fire Pump house, TLF shed, product pump house, T/T locking shed.
- It shall not be possible to insert 24 V plug into 240 V receptacle
- These receptacles shall be energized from lighting panel. Maximum three receptacles shall be connected in one circuit.

13. All fluorescent fixtures shall have energy efficient 'T5' type fluorescent lamps except those in div 2 hazardous area. The louvers of these fixtures shall be designed for 'T5' type fluorescent lamps. All fluorescent lamps shall have 'cool day light color designation. The mirror optics type fluorescent fixtures shall have no iridescence effect.
14. All hazardous area lighting system accessories like poles, fixtures, receptacles, Distribution boards, etc. shall be flameproof.
15. Bidder shall ensure lux levels as per OISD 244 (latest standard).
16. There shall be no dark patches for hazardous and non hazardous areas.

4.3 Ballast

4.3.1 All HPSV fixtures shall be provided with wire-wound ballasts. All fluorescent fixtures except for Class-I, Div-II fittings / increased safety fittings (Div-II / Hazardous Area) shall be provided with electronic ballasts.

4.3.2 Ballast, wherever applicable shall be use Electromagnetic, high frequency performer / pneumatically assembled and hydro mechanically sealed.

4.3.3 Weatherproof type fixtures shall be suitable for use with fluorescent / sodium vapor LEDs as per the requirement.

4.3.4 The angle of cut-off for fixtures with filament lamps / fluorescent tubes shall be in the range 45° min. to 85°, maximum.

4.3.5 The fixtures shall be designed to facilitate easy installation and maintenance, including cleaning, replacements of accessories like lamps / starters, etc. Also, all corresponding parts of similar equipment shall be interchangeable. Connections between different components shall be made in such a way that they will not get loose by small vibrations.

4.3.6 All outdoor fixtures shall be provided with canopy and shall be dust & drip proof having degree of protection equal to IP-55.

4.3.7 The complete fixture body & control gear shall be suitable to withstand the corrosive atmosphere prevalent in chemical plant. All gaskets shall be of neoprene.

4.3.8 The integral housing shall be designed for efficient cooling of the unit.

4.3.9 Fixtures shall be suitable for the mounting arrangements as specified. Fixture mounting arrangements required on lighting fixtures like brackets, clamps, reducer hardware etc. shall be in vendor's scope.

4.3.10 A steel wire protective cage having mesh dimensions not exceeding 50 mm shall be provided for all outdoor fixtures. Mounting arrangement shall be provided on fitting to support the wire guard.

4.3.11 Fixtures shall be designed for continuous trouble free operation under site conditions without reduction in lamp life or without undue deterioration of materials and internal wiring.

4.3.12 The fixtures shall be designed to minimize glare and achieve effective light distribution. The light distribution patterns of cut-off, semi cut-off and non-cut-off fixtures shall be as specified in relevant standards.

4.3.13 All fixtures shall be supplied complete with all accessories like lamps, ballast, power factor improvement capacitors, starters, etc. suitable for operation and guaranteed performance on single phase and neutral, 240 V ± 10%, 50 HZ ± 3%. HPSV fixtures shall have in built voltage compensation feature. Tapping of 200-220-240 V shall be given for all fittings.

4.3.14 Each lighting fixture and control gearbox shall be provided with 2 no. internal and 2 no. external earthing terminal. All metal or metal enclosed parts of the housing shall be bonded and connected to the earthing terminals so as to ensure satisfactory earth continuity throughout the fixture. Facility for looping earthing core of the cable shall be provided.

4.3.15 All fixtures shall be provided with 2 nos. ¾ inch ET threaded entries with one approved type threaded plug to seal the unused entry. Two entries shall be used for looping of circuit wherever required.

4.3.16 All the hardware shall be cadmium plated whereas clamps and supporting brackets shall be hot dip galvanized.

4.3.17 The fixing parts of the enclosure which is to be opened for replacement of bulb shall be so fastened that they can only be unfastened with special tools. Three sets of special tools required for maintenance of fixtures shall be supplied free of cost along with fixtures.

4.3.18 All luminaries and their accessories and components shall be of type readily replaceable by available Indian makes.

4.4 Switch Box

Switch boxes shall be made of 1.6 mm thick, MS sheet with 3 mm. thick decorative, Perspex cover. Switchbox shall be hot dip galvanized

4.5 Junction boxes

Junction box for lighting fixtures shall be deep drawn or fabricated type made of min. 1.6 mm thick CRCA Sheet. The box shall be hot dip galvanized. Bolted cable entry gland plate at the bottom shall be provided. Junction boxes shall be powder coated in light Grey RAL 7035 color.

4.6 Conduits

Wires of different phases shall normally run in separate conduit. For areas illuminated by more than one circuit, the adjacent circuits shall be from different phases. Concealed / surface conduit wiring shall be provided in substation room, MCC room, other enclosed rooms and office area of the buildings. Black stove enameled rigid steel conduits shall be provided for concealed wiring application and galvanized rigid steel conduit shall be used for surface wiring application. All conduits shall be of heavy duty type. All conduit and conduit accessories shall be threaded type. In long distances straight runs of conduit, inspection type couplers at reasonable intervals (10 Mtrs.) shall be provided. In long distances straight runs of conduit, inspection type couplers at reasonable intervals (10 Mtrs.) shall be provided. Minimum diameter of conduit shall be 20 mm for wiring purpose. GI Earth wire of minimum 14 SWG shall be laid along each conduit in order to have earth continuity of it. Wiring for lighting and plug circuits shall be done with 1100 V grade, PVC insulated, HFFR (Halogen Free Flame Retardant) wires using 1.5 sq.mm Cu wires for lighting circuits and 2.5 sq.mm Cu wires for plug circuits. The number of insulated single core cables / stranded wires that can be drawn into rigid steel conduit are given in Table below (Ref: IS 732-1989):

Size of cable		Size of conduit, mm		
Nominal cross sectional area, mm²	**Number and diameter of wires, mm**	**20**	**25**	**32**
1.5	1 / 1.40	7	12	20
2.5	1 / 1.80 3 / 1.06	5	10	18

4.7 Pull-out Boxes

Pull out boxes shall be provided at approximately 4 (four) meter interval in a conduit run Boxes shall be suitable for mounting on Walls, Columns, Structures, etc.. Pullout boxes shall have cover with screw and shall be provided with good quality gasket lining. Pull out boxes shall be weather proof type suitable for IP: 55 degree of protection. Pull out box & its cover shall be hot dip galvanized.

4.8 Lighting Wires

Lighting wires shall be 1100 V grade, light duty PVC insulated, stranded copper wire for fixed wiring installation. colour of the PVC insulation of wires shall be Red, Yellow, Blue and Black for R, Y, B phases & neutral, respectively and white & grey for DC positive & DC negative circuits, respectively. Minimum size of wire shall not be less than 1.5. sq.mm. The size of the lighting wires / cables shall be selected such that the total voltage drop from the LDB to the lighting fixture / receptacle does not exceed 3%.

4.9 Lighting Poles

The poles wherever required shall be of steel tubular swaged type welded pole of specified lengths. Lighting poles shall be painted with two coats of red Oxide and Zinc chromate in Synthetic compound primer on the exposed outside surface and with Bituminous paint all along the inside of the pole and outside portion which shall be embedded in foundation at manufacturing stage.

4.10 Lighting fixtures shall generally be group controlled directly from lighting boards. However, in office areas, control shall be provided through switch boxes. Each switch shall control a maximum of three fluorescent fixtures.

4.11 Wiring shall run throughout in separate conduits. Wires of different phases shall run in different conduits. Wiring for lighting circuits and receptacle circuits shall be carried out in separate conduits and from separate feeders.

4.12 Lighting boards etc. shall be earthed by two separate and distinct connections with earthing system. Switch boxes, junction boxes, lighting fixtures, fans, single phase receptacles etc. shall be earthed by means of separate earth continuity conductor. The earth continuity conductor 14 SWG GI wire shall be run along with each conduit run. Cable armours shall be connected to earthing system at both the ends.

5.0 TESTS

5.1 All lighting LED fixtures shall be subjected to acceptance and routine test, as per relevant specified standards.

5.2 Junction boxes, switch boxes, receptacle enclosure etc. shall be subjected to physical and dimensional checks.

5.3 Galvanizing Tests

5.4 The quality of galvanizing shall be smooth, continuous, and free from flux stains and shall be inspected visually.

5.5 Lighting transformer tests shall be as per IS 11171.

5.6 In addition following tests shall be conducted as acceptance tests.

a. Uniformity of coating - The coating of any article shall withstand four 1minute dips in standard copper sulphate solution without the formation of an adherent red spot of metallic copper upon the basic metal.
b. The quality of cadmium / zinc plating on items with screw threads shall be free from visible defects such as unplated areas, blisters and modules and shall be inspected visually.
c. In addition, the plating thickness shall be determined microscopically / chemically or electronically.

6.0 COMMISSIONING CHECKS

6.1 On completion of installation work, the Contractor shall request the Project manager for inspection and test with minimum of fourteen (14) days advance notice.

6.2 The Project manager shall arrange for joint inspection of the installation for completeness and correctness of the work. Any defect pointed out during such inspection shall be promptly rectified by the Contractor.

6.3 The installation shall be then tested and commissioned in presence of the Project manager.

6.4 The contractor shall provide all, men material and equipment required to carry out the tests.

6.5 All rectifications repair or adjustment work found necessary during inspection, testing and commissioning shall be carried out by the Contractor without any extra cost. The handing over the lighting installation shall be effected only after the receipt of written instruction from the Employer / his authorized representative.

6.6 The testing shall be done in accordance with the applicable Indian Standards and codes of practices. The following tests shall be specifically carried out for all lighting installation.

a. Insulation Resistance.
b. Testing of earth continuity path.
c. Polarity test of single phase switches.
d. Functional checks.

6.7 The lighting circuits shall be tested in the following manner:

a. All switches ON and consuming devices in circuit, both poles connected together to obtain resistance to earth.
b. Insulation resistance between poles with lamps and other consuming devices removed and switches ON.

7.0 DISTRIBUTION BOARDS

1. The flameproof and non flameproof distribution boards shall be supplied, erected, tested and commissioned per attached SLD and BOQ.

ANNEXURE - A

Area	Lux level
Main roads (Gate entry / exit, roads around TT gantry	20
Secondary roads (along storage tanks & Periphery etc)	10
Tank farm area	20
Pump / Compressor / Dosing Sheds / Fire Pump House	100
Main Operation Platforms & Access Stairs (TT and TW gantry, Tank manifold)	60
Ordinary Platforms	20
OWS / ETP Area	60
Sub Station / PMCC room	150
Transformer yard / HT Di pole area	100
Battery room, Charger / UPS rooms	150
Control Room bldg. / laboratory	400
Lube Warehouse	100
Admin Building	300
Security Cabin / Watch Booth	100
Stairs	50
Corridors	70
Tank truck Parking area	20

NOTE:

Any additional fixtures required to take care of the dark patches / shadows shall also be provided.

ANNEXURE - I
DOCUMENTATION FOR LIGHTING FIXTURES AND ACCESSORIES

Sl. No.	Document Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification Sheets, duly completed	Y	Y	Y
2.	Technical particulars, duly filled-in	Y	Y	Y
3.	Illustrative and descriptive catalogues indicating general arrangement, light distribution, light absorption and utilisation factors, full load currents, power factors and power requirement for each type of fixture including control gear losses.	N	Y	Y
4.	Sketch showing mounting arrangement with dimensions.	Y	Y	Y
5.	Type Test Certificates for			
	a. Hose proof fixtures			
	b. Flame proof fixtures	Y	N	Y
	c. Division-2 area fixtures			
6.	Spare parts list	Y	N	Y
7.	Test certificates	N	N	Y
8.	Guarantee certificates	N	N	Y

Note:

1. 4 hard copies & 1 soft copy shall be supplied with bid.
2. 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
3. 8 hard copies & 2 soft copies in CD shall be submitted as final documents prior to despatch of the equipment. These shall be made in sets and supplied in fine plastic coated folder.

Y - Yes, N - No

LV CONTROL CABLES SPECIFICATION

CLIENT: DELHI AVIATION FUEL FACILITY (P) LIMITED, NEW DELHI

CONSULTANT: SAGA GLOBAL CONSULTANTS, MUMBAI

0	04-10-2018	Issued for Approval	PBS	PBS	SKJ	
Rev	**Date**	**Description**	**Prepared**	**Reviewed**	**Approved**	**Client Review**

INDEX

ANNEXURES

Annexure No.	Description
I	DOCUMENTATION FOR CABLES

1.0 SCOPE

This specification covers the technical requirements for the design, manufacture, inspection and testing at vendor's works of PVC insulated cables upto 1.1 kV voltage grade for lighting purpose to be used in the TT Parking and Control Room for DAFFPL Project.

2.0 CODES AND STANDARDS

The design, manufacturing, testing and performance of PVC Cable shall comply with all currently applicable statutory act, regulations and safety codes in the locality where the equipment will be installed. Nothing in this specification shall be construed to relieve vendor of his responsibility.

Unless otherwise specified. The Cable shall comply with the applicable relevant Indian Standards.

IS: 613	Copper rods and bars for electrical purposes
IS: 1885-(Part32)	Electro Technical vocabulary - electric cables
IS: 2633	Method of testing uniformity of coating on zinc coated articles.
IS: 3961-(Part4)	Recommended current ratings for Polyethylene insulated cables.
IS: 3975	Mild steel wire, formed wires and tapes for armouring of cables.
IS: 5831	Specification for PVC insulation and sheath of electric cables.
IS: 6474	Specification for Polyethylene insulation and sheath of electric cables.
IS: 1554	Specification for PVC insulated (Heavy duty) electric cables
IS: 8130	Conductors for insulated electric cables and flexible cords.
IS: 10418	Drums for electric cables.
IS: 10462	Fictitious calculation method for determination of dimensions of protective coverings of cables
IS: 10810 (Pt 58)	Methods of test for cables: Part 58 Oxygen Index test
IS: 10810 (Pt 61)	Methods of test for cables: Part 61 Flame retardant test
IS: 10810 (Pt 62)	Methods of test for cables: Part 62 Flame retardant test for bunched cables
IEC: 60502	Extruded solid dielectric insulated power cables for rated voltages from 1 KV upto 30 KV
IEC: 60540 / A	Test methods for insulation & sheaths of electric cables
IEC: 230	Impulse tests on cables and their accessories
IEC: 60332	Tests on electric cables under fire conditions

IEC: 811	Test methods for insulating and sheathing materials of electric cables.
IEC: 840	Tests for power cables with extruded insulation for rated voltages above 30 KV upto 150 KV
ASTM: D2863	Standard method for test for flammability of plastics using oxygen index method
IECAS-61-402	Thermoplastic insulated wire & cable for transmission & distribution of electrical energy
IECAS-66-524	Cross linked thermosetting poly ethylene insulated wire & cable for transmission & distribution of electrical energy
IEC: 840	Tests for power cables with extruded insulation for rated voltages above 30 KV up to 150 KV

In case of any contradiction between various referred standards / specifications / data sheets and statutory regulations, the following order of priority shall be given:

i. Statutory regulations
ii. Data sheets
iii. This Specification
iv. Codes & Standards

The cables & accessories shall also confirm to the provisions of the latest revisions of Indian Electricity rules & any other statutory regulations currently in force.

3.0 AMBIENT CONDITIONS

Service conditions shall be defined as

- Maximum ambient temperature: 48.4 °C.
- Minimum ambient temperature: -2.2 °C.
- Relative humidity: Max100% Min-25%
- Wind speed: 47 m/sec
- Elevation - 237 mtr above MSL

4.0 GENERAL CONSTRUCTION AND MATERIAL OF CONSTRUCTION

1. The cables shall be suitable for laying in conduits .
2. Outer sheath of all PVC insulated cables shall be black in color and minimum value of the oxygen index shall be 29 at 27+/-2 °C. In addition suitable chemicals shall be added in to the PVC compound of the outer sheath to protect the cable against rodent & termite attack.
3. Sequential marking of the length of the cable in the meters shall be provided at every one meter. The embossing or engraving shall be legible or indelible.
4. The overall diameter of the cables shall be strictly as per the values declared by the manufacturer in the technical information subject to a maximum tolerance of +/- 2 mm up to overall diameter up to 60 mm and +/- 3 mm for above 60 mm.

4.1 PVC insulated FRLS cables

1. All control cables shall be heavy-duty type, 650 / 1100 V grade, with Copper Conductor, PVC insulated, inner sheathed, armoured and overall FRLS PVC sheathed. All cables covered in this specification shall be FRLS unless otherwise specified in the data sheet. The outer sheath of PVC cables shall possess flame propagation properties meeting requirements as per IS-10810 (Part-62) category AF. Exact type of the cable shall be as specified in the cable quantity list.

4.2 Conductor

1. The conductor shall be composed of high conductivity annealed copper of class-2 complying with relevant Indian standards. The conductors of size above 6 sqmm shall be stranded.
2. Maximum conductor temperature for continuous operation is 70□C and Max short circuit temperature is 160□C.
3. Conductor shall withstand the mechanical and thermal stresses under steady state and transient operating conditions.
4. Laying up of cores shall be as per relevant IS standards.

4.3 Insulation

1. The insulation shall be of polyvinyl chloride (PVC) compound applied over the conductor by extrusion and shall conform to the requirements of insulation as per IS: 5831.

4.4 Filler and inner sheath

1. The filler and inner sheath shall be of the following:

   a. Unvulcanized rubber, or
   b. Thermoplastic materials

2. Unvulcanized rubber or thermoplastic material used shall not be harder than PVC used for insulation and PVC used for outer sheath. The material chosen shall be compatible with temperature ratings of the cable and shall have no harmful effect on any other component of the cable.
3. The inner sheath shall be applied by extrusion method such that it fits closely on the laid-up cores and shall be possible to remove without damaging the insulation.
4. Single core cables shall have no inner sheath.
5. Inner sheath shall be extruded PVC compound conforming to type ST1 of IS 5831 for multicore cable

4.5 Armoring

1. Armoring shall be of,

   a. Galvanized round steel wire, or
   b. Galvanized steel strip, or
   c. Any metallic non-magnetic wire / strip

2. Armoring shall be applied over insulation / inner sheath for single / multicore cables respectively, as close as possible.

3. Where the cable diameter below armour does not exceed 13 mm, the armour shall consist of galvanized round steel wires and where the diameter below the armour is greater than 13 mm, the armour shall consist of galvanized steel strips.
4. The joints in armour wires or strips shall be made by brazing or welding and any surface irregularity shall be removed.
5. All cables covered in this specification shall be gas / dry cured, flame retardant low smoke (FRLS) unless otherwise specified in the data sheet. The outer sheath of PVC insulated cables shall possess flame propagation properties meeting requirements as per IS-10810 (Part-62) category AF.
6. Armour coverage shall be minimum 90%.

4.6 Outer sheath

1. The outer sheath shall be of poly-vinyl chloride (PVC) compound conforming to the requirements of type ST1 compound as specified in relevant standards and shall be of FRLS type only. The outer sheath of cable shall be black in colour and the minimum value of oxygen index shall be 29 at 27 + 2 deg C
2. The outer sheath shall be applied by extrusion over the insulation or insulation screening or armour as applicable.
3. In case of FRLS cables, PVC compound used for the outer sheath shall have reduced flame propagation property, shall have reduced emission of halogen gas fumes etc., when severely overheated during fires.

4.7 Dimensions / thickness of material

1. The thickness of insulation, inner sheath, outer sheath and dimensions of wire / strips used for armouring shall be as per relevant standards.

4.8 Heat resisting cables

1. If heat resisting PVC cables are specified in the data sheet, the following shall be the requirements:
2. It shall be possible to continuously operate the cable at a maximum conductor temperature of 85 deg. C. PVC compounds used for HRPVC cables shall be as follows:

a. Conductor insulation - Type C
b. Inner sheath - Type ST2
c. Outer sheath - Type ST2

5.0 CORE IDENTIFICATION:

1. Cores of cable shall be identified by colour coding of PVC insulation by adopting the following scheme.

a.	1 core	Red, black, yellow, blue or natural
b.	Two core	Red and Black
c.	Three core	Red, Yellow and Blue
d.	Four core	Red, Yellow, Blue and Black
e.	Five core	Red, Yellow, Blue, Black and grey

2. For 5 Cores and above, it would generally be number coded as per Cl. 10.3 of IS 1554-1 starting with number 1 of inner layer.
3. The core identification shall be done by printing numbers or by providing colored strips all along cores. The insulation of cores shall be of the same colour and numbered sequentially. The numbers shall be printed in Hindu-Arabic numerals on the outer surface of cores. The numerals shall be legible. The numbers shall be repeated at regular intervals along the core and the spacing between consecutive numbers shall not exceed 50 mm.

6.0 IDENTIFICATION OF CABLES

1. The cables shall be clearly and permanently marked with following information throughout the length of cable.

a. Manufacturer’s name or trade mark.
b. Year of manufacture.
c. Voltage grade.
d. Cross sectional area of conductor and no. of cores.
e. Type of Insulation

f. FRLS
g. ISI mark and ISI reference number
h. Cable Code
i. Colour Identification
j. Batch No. / Lot No.

7.0 CABLE ACCESSORIES

1. The termination kits for use on high voltage systems shall be suitable for the type of cables offered as per this specification and Heat shrinkable type. The termination shall be supplied in kit form. The kit shall include all insulating and sealing materials apart from conductor fittings and consumable items. An installation instruction shall also be included in each kit. Specific approval based on type tests shall be obtained from the owner for the list of suppliers of these kits.

8.0 CABLE DRUMS

1. Cables shall be supplied in non-returnable drums wooden or steel drums of suitable barrel diameter, securely battened, with take-off end fully protected against mechanical damage. The wood used for construction of drum shall be properly seasoned, free from defects and wooden preservatives shall be applied to entire drum. All ferrous parts shall be treated with a suitable rust preventive finish or coating to avoid rusting during transit or storage.
2. PVC / Rubber end caps shall be supplied free of cost for each drum with a minimum of eight per thousand meter length.
3. The following information shall be marked on each drum

a. Name of manufacturer, brand name or trademark.
b. Nominal cross sectional area of conductor.
c. Number of cores.
d. Type of cable and voltage grade.
e. Cable code
f. Length of cable on the drum.
g. Number of lengths on drum (if more than one).

h. Drum number
i. Direction of rotation of drum (by means of an arrow).
j. Reference standard
k. Approx. gross weight.
l. Job number
m. Country of manufacture
n. Year of manufacture.

4. A tolerance of +/- 3% shall be permissible for each drum. However, overall tolerance for each size of cable shall be limited to +/ - 2%. Offer with short / non-standard lengths are liable for rejection. If non- standard drum lengths are specified in the data sheet, then same shall be supplied.

9.0 TOTAL QUANTITY VARIATION

1. The bidder shall quote unit rates for all types of cables as indicated in the cable quantity list. The unit rate quoted by the bidder shall be valid in the event of addition / deletion of cable quantity.
2. Quantity shown in the Bill of Material annexed to this specification is for bid purpose only. The quantity shall be revised after placement of order as per actual requirement.
3. Bidder shall not start manufacturing unless written manufacturing clearance is obtained from the purchaser. Any manufacturing prior to approval shall be rejected.
4. Unit rates for addition / deletion will be applicable for length upto +2.5%. Bidder can not claim for any quantity supplied above +2.5% of the NTP (notice to proceed) quantity, no payments will be made for extra quantity supplied above +2.5% of NTP quantity.

10.0 INSPECTION AND TESTS

1. Inspection and testing shall be carried out in accordance with relevant standards. Routine tests and acceptance test shall be witnessed by DAFFPL / DAFFPL approved Third Party Inspection Agency. Vendor shall quote unit rate for witnessing such type test by TPI Agency.

2. Vendor shall submit blank formats where in the test results/readings are to be entered. This format shall give minimum acceptable value as per the relevant standards.
3. Vendor to confirm availability of Type test certificates along with offer. Type test certificates, for all types of cables being ordered, shall be furnished by vendor in the event of an order. Type tests reports as listed below for similar size & type of cables shall be submitted for purchaser's review along with the bid, and shall not be older than 5 years on the date of submission. Tests shall have been conducted at an accredited laboratory.
4. The inspector shall have free access to free access to the manufacturer's works for the purpose of inspecting the process of manufacture in all stages and he will have the power to reject any material which appears to him to be of unsuitable description or of unsatisfactory quality. The vendor shall give at least 2 weeks prior notice to the purchaser, regarding the date of testing to enable him or his representative to witness the tests.
5. All routine tests, acceptance tests, type tests & additional type tests for improved fire performance shall be carried out as listed in IS-7098 (Part-2).
6. The inspector shall have free access to the manufacturer's works for the purpose of inspecting the process of manufacture in all stages and he will have the power to reject any material which appears to him to be of unsuitable description or of unsatisfactory quality. The vendor shall give at least 2 weeks prior notice to the purchaser, regarding the date of testing to enable him or his representative to witness the tests.

10.1 ROUTINE TESTS

1. All routine tests, acceptance tests, type tests & additional type tests for improved fire performance shall be carried out as listed in IS-7098 (Part-1 & 2).
2. The test requirement for PVC insulation & sheath of cables shall be as per latest revision of IS: 5831.
3. The finished cables shall be tested at manufacturer's works. Following routine tests for each and every length of cable and copy of test results shall be furnished for each length of cable along with supply. If specified, the cables shall be tested in presence of client's representative.

10.1.1 HIGH VOLTAGE TEST

The cables shall withstand without any failure, the test voltages given below, when applied for a period of five minutes for each test connection.

VOLTAGE GRADE	TEST VOLTAGE
kV	kV
1.1	3

10.1.2 CONDUCTOR RESISTANCE TEST:

The D.C. Resistance of each conductor shall be measured at room temperature and the results shall be corrected to 20° c. to check the compliance with the values specified in IS 8130 - 1976.

10.1.3 THE TEST FOR RESISTANCE TO ULTRAVIOLET RADIATION:

This test shall be carried out as per DIN 53387 or ASTM-G-53 on outer sheath. The retention value of tensile strength & ultimate elongation value after the test shall be minimum 60% of the tensile strength and elongation value before the test. The test certificates with respect to this test (not older than 1 year) from recognized testing laboratory to be furnished for review by PMC before dispatch clearance of cables. In case test certificates are not available, test is to be conducted by vendor at his own cost in any recognized test laboratory or in-house testing laboratory, before dispatch clearance of cables. Sampling for this test is to carried out one for each order, provided the outer sheath remains the same.

10.2 ACCEPTANCE AND SPECIAL TESTS

Acceptance tests as per IS-1554 Part-1 and IS-7098 Part-1 and the following special tests to be performed on the cables as per the sampling plan. This tests are to be witnessed by PMC / Owner before the dispatch of cables:

10.2.1 ACCELERATED WATER ABSORPTION TEST

Accelerated Water absorption test for insulation as per NEMA – WC-5 (For PVC insulated cables) and as per NEMA WC-7 (For XLPE insulated cables). Test certificates with respect to this test (not older than one year) from recognized testing laboratory to be furnished for review by PMC before dispatch, clearance of cables. In case test certificates are not available, test is to be conducted by vendor at his own cost in any recognized test laboratory or in house testing laboratory, before dispatch clearance of cables. Sampling for this test is carried out one for each order.

10.2.2 DIELECTRIC RETENTION TEST

The dielectric strength of the cable insulation tested in accordance with NEMA WC-5 at 75 ± 1°C shall not be less than 50% original dielectric strength. Test certificates with respect to this test (not older than one year) from recognized testing laboratory to be furnished for review by PMC before dispatch, clearance of cables. In case test certificates are not available, test is to be conducted by vendor at his own cost in any recognized test laboratory or in-house testing laboratory, before dispatch clearance of cables. Sampling for this test is to carried out one for each order.

10.2.3 OXYGEN INDEX TEST:

The test shall be carried out as per ASTM D2863 or applicable Indian Standard specifications. Sampling to be done for every offered lot / size as per sampling plan.

10.2.4 FLAMMABILITY TEST:

1. The test shall be carried out on finished cable as per IS-10810 (part 61 & 62). Sampling for this test is to be carried out one for each order, provided the outer sheath remains the same. The acceptance criteria for tests conducted shall be as under:

a. Part-61: The cable meets the specifications if there is no visible damage on the test specimen within 300 mm from its upper end.
b. Part-62: The maximum extent of charred portion measured on the test sample should not have reached a height exceeding 2.5m above the bottom edge of the burner at the front of the ladder.

10.2.5 TEST FOR RODENT & TERMITE REPULSION PROPERTY:

1. The vendor shall furnish details to analyze the property by chemical method. Sampling to be done for every offered lot / size as per the sampling plan.

10.2.6 TYPE TEST

The following Type test certificate issued by Government approved laboratories like CPRI / ERDA shall be submitted to the inspector before placement of order and before dispatch commencement at site.

1. Test for thickness of insulation and sheath
2. Physical tests for insulation.

    a. Tensile strength and elongation at break.
    b. Ageing in air oven.
    c. Hot test.
    d. Shrinkage test.
    e. Water absorption (Gravimetric)

3. Physical Test for outer sheath:

    a. Tensile Strength and elongation at break.
    b. Ageing in on even.
    c. Shrinkage Test.
    d. Hot deformation.

10.2.7 CERTIFICATION

1. All offered equipments or equipment of similar design manufactured by same supplier:

   a. Shall have been type tested by an authority approved by the Company.
   b. Shall have been in continuous satisfactory service for a minimum period of two years.
   c. Shall be having current certification / approval listing by an approved agency.

11.0 INFORMATION REQUIRED WITH THE BID

1. Vendor shall furnish technical particulars / description and performance details of all cables, current carrying capacities and derating factors for all conditions of cable laying.
2. Type test report and certificates
3. QAP
4. Armour coverage calculation

Documents required for approval after award of contract shall be decided during kick off meeting with the successful vendor. Any data / document required for approval shall be submitted by vendor during detail engg.

Unless otherwise stated elsewhere the number of sets will be 3 sets hard with one soft copy for initial submission / revision submissions and 10 sets hard and one set soft for as built final submission.

12.0 TRANSPORT AND SHIPMENT

Transport and shipment of items will be contractor's responsibility. Contractor need to follow the instructions for the same detailed under the 'Electrical scope of work' in bid package.

13.0 WARRANTY

Vendor shall have final and total responsibility for the design and performance of all the equipment supplied under this specification. The equipment and material shall be guaranteed for trouble-free operation for a period of 12 months from the date of commissioning or 18 months from the date of dispatch whichever is later.. Any defect discovered during this period shall be rectified free of charge.

ANNEXURE - I
DOCUMENTATION FOR CABLES

Sl. No.	Document Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification Sheet, duly completed	Y	Y	Y
2.	Technical Particulars, duly filled-in	Y	Y	Y
3.	Illustrative and Descriptive catalogues	Y	N	Y
4.	Installation, Termination and Jointing Instructions	N	N	Y
5.	Test certificates			
	a. Routine	N	N	Y
	b. Type	Y	N	Y
6.	Guarantee Certificates	N	N	Y

Note:

1. 4 hard copies & 1 soft copy shall be supplied with bid.
2. 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
3. 8 hard copies & 2 soft copies in CD shall be submitted as final documents prior to despatch of the equipment. These shall be made in sets and supplied in fine plastic coated folder.

Y - Yes, N – No

Cable Tray

CLIENT: DELHI AVIATION FUEL FACILITY (P) LIMITED, NEW DELHI

CONSULTANT: SAGA GLOBAL CONSULTANTS, MUMBAI

Rev	Date	Description	Prepared	Reviewed	Approved	Client Review
0	04-10-2018	Issued for Approval	PBS	PBS	SKJ	

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1.0 SCOPE

This specification covers the general design, engineering and procurement of materials, fabrication and supply requirements of ladder type cable trays for electrical power cables and perforated type cable trays for electrical power / Control / Lighting cables.

STATUTORY REQUIREMENTS, CODES & STANDARDS

The design and the installation of the equipment shall be in accordance with established codes, good engineering practices and shall confirm to the statutory regulations applicable in the country.

The main codes, standards and statutory regulations considered as minimum requirements are as given below. Latest version of these shall be followed:

- International Electro-technical Commission (IEC)
- International standard organization (ISO)
- The Institute of Petroleum (IP)
- American Society for Testing and Materials (ASTM)
- Institute of electrical & electronics engineers (IEEE)

The design and terminology shall comply as a minimum with the latest editions of the engineering codes, standards and practices as below. However system / equipment design shall be in line with latest of all applicable standards-

Codes	Description
ASTM A123	Zinc (hot-galvanized) coatings on products fabricated from rolled, pressed and forged steel shapes, plates, bars and strips
ASTM A153	Standard Specification for Zinc coating (hot-dip) on iron and steel hardware
ASTM A446	Specifications for Steel Sheet Zinc Coated (Galvanized) by Hot Dipped Process
ASTM A490	Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints

ASTM A563	Carbon and Alloy Steel Nuts
IEC 60050	International Electro technical Vocabulary
IEC 61537	Cable management

Codes and standards shall be inclusive of all the amendments at the time of order.

The equipment shall also conform to the provisions of local Electricity rules and other statutory regulations currently in force in the country.

Any conflicts between the referenced documents shall be identified to BUYER in Writing for resolution. In general the order of precedence shall be as follows:

- Statutory Regulations
- Technical Specifications
- Purchase Order
- Tender and any other documents forming part of the Contracts
- Electrical Design Basis
- Referenced Codes & Standards

2.2 GENERAL REQUIREMENTS

The offered equipment shall be brand new with state of the art technology and proven field track record. No prototype equipment shall be offered.

Vendor to ensure availability of spare parts and maintenance support services for the offered equipment at least for 15 years from the date of supply

Vendor shall be responsible for design, engineering and manufacturing of the equipment to fully meet the intent and requirements of this specification and data sheets.

All equipment and accessories required for completeness of the equipment, whether specifically mentioned or not, but considered essential for satisfactory performance shall be included as a part of the offered equipment.

3.0 SITE CONDITION

All the cable trays and their accessories shall be suitable for installation in salt laden, humid and corrosive atmosphere, and shall be designed to operate under specified site conditions.

- Maximum ambient temperature: 39 °C.
- Minimum ambient temperature: 5 °C.
- Relative humidity: 73-84 %.
- Wind speed: 0.194 - 0.69 m/sec
- Elevation 29 mtr above MSL

4.0 ELECTRICAL DESIGN REQUIREMENTS

4.1 GENERAL TECHNICAL REQUIREMENTS

Gl racks and Accessories shall have Zinc Coating of 610 gm/Sq.m applied by hot dip galvanizing process. Galvanizing shall be uniform, adherent, smooth and free from defects.

The finished rack accessories shall be free from sharp edges and corners, burrs and unevenness. Stepped arrangement of bending is not acceptable. The channel members in the bending shall have uniform curvature and shall be made out of single piece.

For terminal area, all cable trays and accessories shall be prefabricated, 2 mm thick hot dipped Galvanized sheet steel ladder trays with rungs at 300 mm interval.

Maximum width of trays will be 800 mm. Collar height will be 200 mm.

Support span 2500 mm for horizontal & 2000 mm for vertical tray supports. In addition to this, 105 kg concentrated load at Centre span shall be considered for horizontal trays. Cable tray installed vertically shall be fastened at intervals which will not allow sag in the cables or cause the damage. Nuts, bolts and any other hardware to be used in cable trays shall be stainless steel. Cable ladder routes shall be bonded to the earth

grid via green/yellow PVC covered cables. Fastening of cables in cable ways shall be done with UV resistant (Black) PVC cable ties.

Coupler plate shall be fitted at each side runner at one end. The coupling plates shall be supplied with bolts, nuts and washers fitted at the other four holes for fixing to adjoining member. Each side runner shall have two coupler plates (one on inside face and one on outside face).Coupling plates shall be designed to permit longitudinal adjustment up to +/-10 mm and skew up to 10°.The side runner shall have suitable holes at every meter for cleating earthing conductors.

All the bends, tees and junctions shall be pre-fabricated and shall be made sufficiently rigid by providing suitable Reinforcement on rungs as required.

Side Runner shall be 100 x 20/30 mm Channel as a minimum with the flanges facing inside. Rungs shall be 35x15x5 mm slotted Channel Type and provided at regular interval of maximum 300 mm along Tray Length.

Trays sections (3000mm & 6000mm long) will be installed on prefabricated support and will be bolted to the support in hazardous areas and welded to the support in safe areas.

Trays will be connected by expansion splice plates between their sections and fitted with expansion guide clamps at every 36 m to 40 m intervals. Tray will be connected at other junctions by standard splice plate and fitted with hold-on clamps.

The Cable Tray shall be supplied in standard length of 3000 mm & 6000mm. The maximum allowable middle span deflection shall be 10 mm.

Cable trays used in the outdoor areas shall be provided with covers on top layer, for protection from rain water. The minimum thickness of the cover shall be 2mm. Cable Tray Cover shall be fabricated with Hot Dip Galvanized Sheet Steel with standard length of 3000 mm.

Tolerances in various dimensions shall be as follows:

- Length: ± 5mm
- Width: ± 2mm
- Height: ± 1mm
- Bend: ± 1mm
- Thickness: ± 0.2mm

Positive tolerance on total quantity, up to +5% is acceptable. However negative tolerance on total quantity is not acceptable.

4.2 LADDER TYPE CABLE TRAYS

Ladder type Cable Trays shall be of Prefabricated Hot Dip Galvanized Sheet Steel.

Two parallel ‘I-beam’ or 'H' type side rails linked together by rungs.

Ladder type Cable Trays standard dimensions are as follows:

- Width: 300,600,900 mm
- Length: 3000 mm & 6000mm
- Side rail height: 100,200 mm

Tray I-ladder coupling splice plates shall be expansion type. Tray hold down clamps of standard type shall be provided for one end and combination (expansion) type for other. Safety factor for ladder type cable tray is 1.5

Cable trays shall be supported at an interval of 2000 mm for horizontally and 1500 mm vertically. Galvanization thickness shall be as per ASTM A123 / A153.

Other Accessories: Couplers, Vertical Tee, Reducer, Tee, Cross, Vertical & Horizontal Bend (30 to 90), Horizontal bend Splice Plate, Horizontal & Vertical Adjust Plate, Tray Cover, Tray hold down clamps

4.3 PERFORATED TYPE CABLE TRAYS

Perforated cable trays shall be as per the specification given below:

- Width: 75,100, 150,200 ,300 and 600 mm
- Length: 2500 mm
- Material: Hot-dip galvanized steel
- Sheet thickness: 2.5 mm
- Height: 25 mm
- Steel: As per ASTM A36
- Galvanizing: As per ASTM A123 / A153.

Other Accessories: Couplers, Vertical Tee, Reducer, Tee, Cross, Vertical & Horizontal Bend (30 to 90), Horizontal bend Splice Plate, Horizontal & Vertical Adjust Plate, Tray Cover, Tray hold down clamps.

5.0 INSPECTION AND TESTING

During fabrication, the cable trays and other accessories shall be subject to inspection by Purchaser, or by an agency authorized by the purchaser, to assess the progress of work, as well as to ascertain that only proven raw material is used. The manufacturer shall furnish all necessary information / data concerning the supply to Purchaser's inspectors.

Testing and Inspection of cable trays shall be include but not be limited to the following:

a. Visual Inspection and dimension check shall be made to ensure that good workmanship and practice were maintained throughout the fabrication. Quantitative check shall be made to assure whether all items with accessories are pre- sent according to the order and the packing list.
b. Verification of galvanization thickness. Provide applicable test reports and certificates.
c. All tests shall be conducted as per relevant applicable standards.

6.0 PACKING AND DISPATCH

All the equipment shall be divided into several sections for protection and ease of handling during transportation. The equipment shall be properly packed for the selected mode of transportation, i.e. by ship / rail or trailer, and shall be wrapped in polythene sheets before being placed in crates / cases to prevent damage to finish.

The crates / cases shall have skid bottom for handling. Special notations such as 'Fragile', 'This side up', 'Center of gravity', 'Weight', 'Owner's particulars', 'PO no.' etc., shall be clearly marked on the packages together with other details as per purchase order. The equipment may be stored in a covered shed for long periods before installation. The packing should be suitable for such storage.

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SPECIFICATIONS OF FRP CABLE TRAYS

1. GENERAL

Following specification describes the requirements for FRP CABLE TRAYS.

2. SCOPE OF SUPPLY

2.1 The scope of supply through this specification includes

1. FRP perforated type cable trays.
2. FRP accessories such as bends, tees, crosses, reducers.
3. Connector plates and accessories like bolts, nuts etc.

3. TECHNICAL REQUIREMENTS

3.1 Composite FRP cable bearers shall be manufactured in accordance with IS-6746 standards.

3.2 All Cable Bearers shall be made of E-Glass reinforced Flame retardant Isophthallic polyster (minimum Glass content 45%) and should be corrosion resistant and Fire retardant (Class 1,Fire rating) in accordance with the latest ASTM E-84/IS-6746.

3.3 An additive material shall be mixed with the matrix polyester to make the material Ultraviolet resistant..

3.4 All FRP cable trays shall be manufactured using the PULTRUSION process.

3.5 The Pultruded Cable Bearers should have a minimum thickness of 4.00 mm for all sizes of 100 mm & above,

3.6 Perforated type cable Bearers 50mm width is to be provided in 3.0 mm thickness.

3.7 The Composite FRP Cable Bearers shall be supplied in Drilled/Perforated channels. Drilling/Perforation should be of 8 mm Dia. Holes Perforations/holes should be staggered @ 150 mm lengthwise and minimum 25 mm crosswise.
The material of construction of the Ladder type Cable bearers shall conform to the above specifications.

3.9 The Cable Bearers shall be supplied in lengths of 3 mtrs.

3.10 The construction of cable bearers shall be such as to facilitate easy handing and to ensure easy laying of cables without causing the damage to cables. The inside surface shall be free from sharp edges, burrs or projection. Only machine Molding is acceptable in both the side.

3.11 The cable bearers shall have holes on each end for fixing of coupler plates to join individual cable bearer sections.

3.12 The coupling plate shall also be manufactured of the same material & using the same process-Pultrusion. The minimum thickness shall be 4 mm, minimum length 200 mm & minimum width should be as per width of the joining face of the cable tray.

3.13 Tow coupler plates are to be provided for each length. The couplings between two sections of bearing lengths or associated connections shall be done by SS 316 Bolting only. Site assembly and erection should be made very easy for the contractor.

3.14 The inside depth of the cable trays shall be as follows
- 25mm for 50mm wide tray.
- 50mm upto 300mm wide trays.
- 100mm for 500mm and 600mm wide trays.

3.15 Tolerance on width and length shall be +/- 6mm and height +/- 2mm. Tolerance on width specified is applicable for cable trays of 150mm and above. For lower size cable trays vendor shall mantain a minimum tolerance.

3.16 The inside depth of the cable bearer should not be more than 100 mm.

4. DESIGN LOADING

4.1 For the trays system design in addition to the self load following guidelines shall be considered.

a) Length of the trays : 3000mm.
b) Support span : 1500mm.
c) Cable load for
   i) 150mm width : 30Kgs/Linear Meter
   ii) 300mm width : 60Kgs/Linear Meter
   iii) 500mm width : 70Kgs/Linear Meter
   iv) 600mm width : 90Kgs/Linear Meter

In addition to this, 70Kgs concentrated load at Center span shall be considered.

4.2

a) Length of trays : 3000mm
b) Support span : 1000mm
c) Cable load for
   1) 50mm width : 30Kgs/Linear Meter
   2) 100mm width : 30Kgs/Linear Meter

Concentrated and larger Load for the above two widths shall not be considered.

4.3 The responsibility of matching these with the straight sections lies in the hands of the manufacturers / supplier.

4.4 The Color of cable bearers, equal tees/perpendicular extensions, coupler plates shall be smoke Grey.

5. TESTING AND INSPECTION

5.1 Visual inspection to ensure that good work man ship and practice were maintained throughout the fabrication and assembly. The visual inspection cover that the inner and outer surface is a surface is a strictly as per point no.3.14 of Technical requirement.

5.2 Dimensional Check to be carried out

5.3. Deflection Load Test: Deflection test is to examine the maximum deflection in the product, given the loading conditions as mentioned in the above table. Deflection should be minimum, in accordance with NEMA-FGI/EIL-50-OED-S422., so as to maintain the aesthetics of the product. When deflection test is carried out, percentage recovery of the tray is to be examined. This has to be more than 99 %.

5.4 Burn Test and Flammability Test: The material shall be tested for surface burning characteristic as per ASTME84/IS-6746 and for flammability TEST as per ASTM-E84/UL94/IS-6746 APPENDIX “K”, ASTM D635, UL V 094. The minimum glass content should be 45%.

5.5 Raw material test certificates shall be furnished.

Project Name:	PREPARATION OF ENGINEERING DESIGN DOCUMENTS FOR SEWAGE NETWORK SYSTEM		
Client:	DAFFPL		
Location:	IGI Airport, New Delhi	**Document No.:**	

TECHNICAL SPECIFICATIONS FOR MAINTENANCE FREE EARTH FOR ELECTRICAL INSTALLATION

0	04-10-2018	Issued for Approval	PBS	PBS	SKJ	
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CONTENTS

Serial No.	Description

FOREWORD

Earthing is essential in any electrical installation to provide safety. The conventional GI pipe earthing system employing charcoal & salts are provided for various applications as per IS:3043. Corrosion of metallic parts is comparatively fast besides maintenance by way of watering of earth pits and chiselling of corrosion prone parts & their replacement require monitoring which may not always be feasible in certain crowded and inaccessible areas.

This document is intended to provide guide lines for installation & testing of long lasting earthing system for various applications to meet requirement of rules 51, 61 of Indian Electricity Rule, 1956.

1.0 SCOPE

This specification covers components, enhancing material & jointing used and procedure for constructing the earth pit for maintenance free earthing system to ensure that the resistance to earth is near zero consistent throughout the year.

2.0 REFERENCES

This specification requires the reference to the following documents:

IS 3043-1987	Indian standard code of practice for earthing
IEEE 80	IEEE guide for safety in AC sub-station grounding
IEEE 837	Standard for qualifying permanent connections used in substation grounding.

Indian Electricity Rules 1956 with latest amendments

Wherever, reference to any specification appears in this document, it shall be taken as a reference to the latest version of that specification unless the year of issue of the specification is specifically stated.

3.0 APPLICATIONS

Earthing systems covered in this document shall be for providing effective grounds for

i. Sub-Stations
ii. RTUs, supply control posts
iii. Transformer and Generator neutral earths
iv. Lightning arrester earths
v. Equipment earths including panels
vi. In applications for PRS, UTS, FOIS, COIS, ATMs and data processing centre etc.

4.0 SELECTION OF EARTH SYSTEM

S. N.	Installations / Current Capacity	IR Value Required	Soil Type / Resistivity	Earth System
1.	House hold earthing / 3 kA	8 ohm	Normal Soil / upto 50 ohm - mtr	Single Electrode
			Sandy Soil / between 50 to 2000 ohm - mtr	Single Electrode
			Rocky Soil / More than 2000 ohm - mtr	Multiple Electrodes
2.	Commercial premises Office buildings / 5 kA	2 ohm	Normal Soil / upto 50 ohm - mtr	Single Electrode
			Sandy Soil / upto 2000 ohm - mtr	Multiple Electrodes
			Rocky Soil / More than 2000 ohm - mtr	Multiple Electrodes
3	Transformers, substation earthing, LT line equipment / 15 kA	1 - 2 ohm	Normal Soil / upto 50 ohm - mtr	Single Electrode
			Sandy Soil / upto 2000 ohm - mtr	Multiple Electrodes
			Rocky Soil / More than 2000 ohm - mtr	Multiple Electrodes
4	Transformers, substation earthing, HT line equipment / 40 kA	less than 1 ohm	Normal Soil / upto 50 ohm - mtr	Single Electrode
			Sandy Soil / upto 2000 ohm - mtr	Multiple Electrodes
			Rocky Soil / More than 2000	Multiple Electrodes

S. N.	Installations / Current Capacity	IR Value Required	Soil Type / Resistivity	Earth System
			ohm - mtr	
5	Lightning arresters, extra high current applications etc. / 50 kA	less than 1 ohm	Normal Soil / upto 50 ohm - mtr	Single Electrode
			Sandy Soil / upto 2000 ohm - mtr	Multiple Electrodes
			Rocky Soil / More than 2000 ohm -mtr	Multiple Electrodes
6	PRS, UTS, RTUs, FOIS, COIS, ATMs and data processing centre etc. / 5 KA	less than 0.5 ohm	Normal Soil / upto 50 ohm - mtr	Single Electrode
			Sandy Soil / upto 2000 ohm - mtr	Multiple Electrodes
			Rocky Soil / More than 2000 ohm - mtr	Multiple Electrodes

Note: Single / multiple electrode in above earth system shall be either rod earth electrode or concentric pipe earth electrode as per clause 8.1.

5.0 TYPE OF SOILS

Soil can be classified in to various types, though based on the size of the particles it contains:

5.1 NORMAL SOIL

Black cotton soil, vegetable soil, garden soil, loamy garden, soil shallow black, soil medium black soil, deep black soil and marshy soil etc. having low soil resistivity value (up to 50-ohm meter)

5.2 SANDY SOIL

This type has the big particles and the size of the particles does determine the degree of aeration and drainage that the soil allows. It is granular and consists of rock and mineral particles that are very small. Therefore, the texture is gritty and sandy soil is formed by the disintegration and weathering of rocks such as limestone, granite,

quartz and shale, thus resulting in over-drainage. It warms very fast in the spring season. Coastal area, silt soil, red sandy soil, sandy clay and coastal alluvium etc having soil resistivity up to 2000 ohm-meter are considered as sandy soil.

5.3 ROCKY SOIL

The area containing rocks, pebbles, uneven hard surface laterite soil, lime stone, sand stone, gravel, granite and chalk etc having soil resistivity more than 2000 ohm-meter is considered as rocky soil. This type of soil does not absorb moisture and are extremely poor conductor.

6.0 LOCATION OF EARTH ELECTRODE

Where there is option, site should be chosen in one of the following types of soil in the order of preference given:

a. Wet marshy ground;
b. Clay, loamy soil, arable land.
c. Clay and loam mixed with varying proportions of sand, gravel and stones;
d. Damp and wet sand, peat.

Dry sand, gravel chalk, limestone, granite, very stony ground and all locations where virgin rock is very close to the surface should be avoided,

7.0 MEASUREMENT OF EARTH ELECTRODE RESISTANCE

The earth resistance shall be measured using fall of potential method as per para 37 of IS:3043.

8.0 EARTHING SYSTEM

The earthing system includes earth electrode, installation of earth electrode in suitable pit size, construction of earth pit with cover for the installation, connection

of earth electrode with equipotential earth bus and connection of equipment to equipotential earth bus.

8.1 EARTH ELECTRODE

The earth electrode is the main component of the earthing system which is in direct contact with the ground and thus provides a means of releasing or collecting any earth leakage currents. The material should have good electrical conductivity and should not corrode in a wide range of soil conditions. For an effective earthing system, two types of earth electrodes can be used as described here:

8.1.1 Rod earth electrode

8.1.1.1 High tensile-low carbon steel rod having diameter not less than 17mm complying with requirements of BS 4360 Grade 43A or EN10025:2-004 S275JR, molecularly bonded by 99.99% pure high conductivity copper on outer surface with copper coating thickness 250 micron or more, Length 3000 mm (minimum). Length of the electrode may be increased in multiple of 1 meter to reduce earth resistance if required. To increase the length, pieces of similar rod shall be either exothermally welded to basic 3-meter electrode or connected using socket of suitable size. These sockets shall also be molecularly bonded by 99.99% pure high conductivity copper on inner & outer surface with copper coating thickness 250 micron or more.

8.1.1.2 Copper bus bar of size 250 mm x 50 mm x 6 mm having electrical conductivity of 101% IACS, minimum 99.9% copper content shall be exothermically welded to rod with 4 holes of 12 mm dia. (2 on each side) for connecting earthing conductor.

8.1.1.3 Current carrying capacity: The design of the electrode should be such as to have more than 15 kA current carrying capacity for 1 second.

8.1.2 Concentric pipe earth electrode:

8.1.2.1 Primary conductor

MS pipe with 25 - 50 mm diameter, class B, ISI mark as per IS-1239, Length 2000 or 3000 mm as per table at para 8.1.2.7.

8.1.2.2 Secondary conductor

MS pipe with 40-100 mm diameter, class B, ISI mark as per IS-1239, Length 2000 or 3000 mm as per table at para 8.1.2.7.

8.1.2.3 Conductive mixture

For hermetically filling inside the cavity i.e. between secondary conductor & primary conductor, crystalline compound is to be injected in the electrode assembly. It is a combination of high conductivity metal alloys, copper & aluminium powder, conductive carbon / cement and bonding material etc. mixed in different proportion. The mixture is forced (pressurized) filled inside the earth electrode in the paste form and after solidification of the same, the end caps are welded. The metal alloys shall help in conducting the current and conductive carbon gives anti corrosive property. Bonding material should provide strength to the mixture. Resistivity of the mixture shall be less than 0.2 ohm-meter. Resistivity shall be tested by making a 20cm cube of the material and checking resistance across the opposite face of the cube.

8.1.2.4 Complete electrode shall be molecularly bonded by 99.99% pure, high conductivity copper on outer surface with copper coating thickness 300 micron or more.

8.1.2.5 Its surface shall be clean and free from any visible oxide layer or foreign material.

8.1.2.6 Copper bus bar of size 250 mm x 50 mm x 6 mm having electrical conductivity of 101% IACS, minimum 99.9% copper content shall preferably be exothermically welded to earth electrode or connected with the help of two number stainless steel nut bolts of appropriate size

having 4 holes of 12 mm dia. (2 on each side) for connecting earthing conductor.

8.1.2.7 Current carrying capacity: The design of the electrode should be such as to have more than following current carrying capacity in kA (for 1 second):

S. N.	Current Capacity	Primary Conductor Diameter	Electrode Dimensions (Dia. x Length)
1.	3 kA	25 mm	40 mm x 2000 mm
2.	5 kA	25 mm	40 mm x 3000 mm
3.	15 kA	25 mm	50 mm x 3000 mm
4.	40 kA	40 mm	80 mm x 3000 mm
5.	50 kA	50 mm	100 mm x 3000 mm

Note: For more than 50 KA applications, multiple electrodes of 50 KA capacity shall be installed and connected.

8.2 EARTH ENHANCEMENT MATERIAL:

Earth enhancement material is a superior conductive material that improves earthing effectiveness, especially in areas of poor conductivity (rocky ground, areas of moisture variation, sandy soils etc.). It may contain conductive cement, graphite, hydrous aluminium silicate, sodium montmorillonite etc. and shall not contain bentonite. It improves conductivity of the earth electrode and ground contact area. It shall have following characteristics-

i. It should have low resistivity preferably bellow 0.2 Ohm-meters. Resistivity shall be tested by making a 20 cm. cube of the material and checking resistance across the opposite face of the cube.
ii. It shall not depend on the continuous presence of water to maintain its conductivity.
iii. It should be a little alkaline in nature with pH value >7 but <9, test certificate from NABL approved laboratory to be provided for the composition so designed.

iv. It should have better hygroscopic properties to absorb moisture. It should absorb and release the moisture in dry weather condition and help in maintaining the moisture around the earth electrode.

v. It should have capacity to retain >10% moisture at 105 ºC. Test certificate from NABL approved lab to be submitted for the composition so designed.

vi. It should have water solubility < 5%. Test certificate from NABL approved lab be submitted for the composition so designed.

vii. It should be granular with granule size 0.1 mm to 3 mm.

viii. It should be non toxic, non reactive, non explosive & non corrosive.

ix. It shall be thermally stable between -10 degree centigrade to +60 degree centigrade ambient temperature.

x. It shall not decompose or leach out with time.

xi. It shall not pollute the soil or local water table and meets environmental friendly requirement for landfill.

xii. It should expand & swell considerably and removes entrapped air to create strong connection between earth electrode and soil.

xiii. It should be diffuses into soil pores and creates conductive roots enlarging conductive zone of earth pit.

xiv. It shall be permanent & maintenance free and in its “set form”, maintains constant earth resistance with time.

xv. It shall not require periodic charging treatment or replacement.

xvi. It shall be suitable for any kind of electrode and all kinds of soils of different resistivity.

xvii. It shall not cause burns, irritation to eye, skin etc.

xviii. Minimum quantity of earth enhancement material to be supplied:

For 5’ x 5’ x 10’ earth pit – Min. 75 kgs per pit

For 300 mm bore type earth pit – Min 50 kgs per pit

xix. The Earth enhancement material shall be supplied in sealed, moisture proof bags. These bags shall be marked with Manufacturer’s name or trade name, quantity, batch no & date of manufacture.

8.2.1 Backfill material

Normally the excavated soil shall be used if it is free from sand, gravel and stones. In case the excavated soil contains sand, gravel and stones these shall be removed by appropriate methods such as hand picking, sieving etc. Small proportion of sand in the soil may be permissible. Material like sand, salt, coke breeze, cinders and ash shall not be used because of its acidic and corrosive nature. If the excavated soil contains sand, gravel and stone in large proportion and it is not feasible to remove these economically, good quality soil from other place may be used for backfilling.

While backfilling the soil shall be thoroughly compacted with at least 5 kg compactor. In case the soil is dry, small quantity of water may be sprinkled only to make it moist enough suitable for compacting. Large quantity of water may make the soil muddy which is not suitable for compacting and after drying the soil may contain voids which may permanently increase earth resistance.

8.3 EQUIPOTENTIAL BUS & EARTHING CONDUCTOR

i. A copper bus bar of size 300 mm x 25 mm x 6 mm to be installed in the equipment room as equipotential bus and must be connected with preferably copper strip of 25 mm x 3 mm (suitable length) from instrument to the bus bar. The connecting terminal of the earth electrode to the bus bar must be connected by copper strip of 25 mm x 3 mm (suitable length) buried inside a trench of 300 mm width x 600 mm depth (from the earth pit to the nearest wall). It shall be duplicated. However, it shall be ensured that only minimum required length is used and any extra length is cut away to keep the earth impedance minimum.

ii. It shall be high conductivity copper having electrical conductivity of 101% IACS i.e. minimum 99.9% copper content The maximum specific resistance of the copper strip earthing conductor shall be 17.241×10^{-7} ohm cm at 20 °C.

iii. At a temperature of 20 °C, its density shall be 8.89 gm/cm^3.

iv. Its surface shall be clean and free from any visible oxide layer or foreign materials.

v. It shall preferably be connected to earth electrode and earth bus bar with the help of exothermic welding or at least two number stainless steel nut bolts of appropriate size.

vi. Normally a single length of copper strip shall be used for each duplicate copper strip earthing conductor and no joint should be used. However, in situation

requiring greater length one joint in each copper strip shall be permitted. The joints shall be made by exothermic welding of at least 10mm overlapping portion of the strips.

8.4 CONSTRUCTION OF UNIT EARTH.

i. Make 5 ft x 5 ft x 10 ft earth pit. If it is not possible to make such a pit due to non-availability of clear space at locations like ATM, High mast lighting tower, Passenger information systems, PRS etc. or in rocky soil, min. 300 mm bore up to 10 ft deep can be made using earth auger or any other method. Earth pit larger than specified size can be made, if required.
ii. Sleeve the soil digged and remove the gravels and stones. If soil quality is good (without Murum and rocks) then add some quantity of earth enhancement material in the soil for using as backfill.
iii. If the soil seems unusable (containing large quantity of gravel, stones, murum, sad etc.) then replace the soil with black cotton soil.
iv. Insert the electrode at the centre of the earth pit and arrange to keep it vertical in the pit.
v. Arrange for adequate quantity of water supply for the earth pit. (Approx. 600 litres)
vi. Fill the pit with the backfill and keep on adding the earth enhancement material surrounding the electrode and simultaneously watering the pit.
vii. With a steel bar or pipe, keep on poking the soil gel and stirring intermittently for removing the air pockets and proper settlement of the pit.
viii. The procedure to be repeated till completion of the filling of the earth pit along with the packing material and sufficient watering adequate ramming.
ix. The pit should be very compactly rammed and watering for 2-3 days and addition of soil if required be done.
x. Make trench of 600 mm (depth) x 300 mm (wide) from the earth pit to the nearest point of connection.
xi. Construct inspection chamber with cover for the installation.
xii. Measure the earth resistance as per IS 3043:1987 code of practice. Earth resistance value shall be less than 1 ohm in non-rocky/non-sandy surface by single electrode Installation and in rocky surface by multiple electrode installation (not more than three electrodes & its individual earth pits). For earthing purpose, if solid rocky layer is found within 10 feet from ground level while digging the earth pit then it is

considered rocky surface. Coastal area, silt soil, red sandy soil and sandy clay are considered as sandy surface.

xiii. If required resistance is lower than the resistance of single earth electrode then multiple earths can be constructed and interconnected.

8.4.1 Construction of ring earth by providing multiple earth pits

i. Wherever it is not possible to achieve required earth resistance with one earth electrode / pit due to difficult / rocky soil conditions, provision of ring earth consisting of more than one earth pit shall be done. The number of pits required shall be decided based on the resistance achieved for the earth pits already installed. The procedure mentioned above for one earth pit shall be repeated for other earth pits.
ii. The distance between two successive earth electrodes shall be min. 3 mtrs / and max. up to twice the length of the earth electrode.
iii. These earth pits shall then be inter linked using 25 X 3 mm copper strip or 50 x 6 mm GI strip to form a loop preferably using exothermic welding or with the help of at least two number of stainless steel nut bolts of appropriate size.
iv. The interconnecting strip shall be buried no less than 600 mm (0.6 m) below the ground level. This interconnecting strip shall also be covered with earth enhancing compound.

8.4.2 Inspection chamber

i. A 300 X 300 X 300 mm (inside dimension) concrete box (wall thickness min. 50 mm) with smooth cement plaster finish shall be provided on the top of the pit. A concrete lid 25 to 50 mm. thick, with pulling hooks, painted black shall be provided to cover the earth pit. PVC sleeve of appropriate size shall be provided in concrete wall to take out earthing connections.
ii. The masonry work shall be white washed inside and outside.
iii. Care shall be taken regarding level of the floor surrounding the earth so that the connector is not too deep in the masonry or projecting out of it.
iv. Earth Pit Cover shall be made of heavy duty poly plastic of size 25cm dia and 25cm deep.

v. Indicator Plate: A indicator(metallic) of size30cm x 30cm with minimum 50cm long support for fixing in ground shall be provided on each earth pit indicating following:
(i)Pit no (ii) Earth Pit & max resistance values (iii) Date of testing (iv) Due date of testing (v) Equipment name etc.

9.0 MARKING:

The marking shall be clear, distinct and visible to the naked eye from a distance of about 1 meter; the size of marking shall be of minimum 25 mm. Following information shall be legibly and indelibly marked on the packed sets:

a. Specification no.
b. Name of the manufacturer
c. Batch no. & Date of manufacturer
d. Current carrying capacity

10.0 TESTS-

Following tests shall be done on one sample-

10.1 Testing of copper coating shall be done as described below:-

i. The copper coating mentioned in clause 8.1 shall not be less than the prescribed thickness at any point and shall comply with the adherence requirement in para (ii) & (iii) below.
ii. Length of the electrode with one end cut to a 45 degree point shall be driven between two steel clamping plates or the jaws of a vise set 0.04 in (1.02 mm)

iii. less than the diameter of the electrode, so as to shear off sufficient metal to expose the bond between the copper coating and electrode. Peeling of the coating by the steel plates or the jaws of the vise is acceptable, but there shall be no other evidence of separation of the coating from the metal core.

iv. At room temperature, a length of the electrode is rigidly held in a clamp or vise and the free end is bent by applying a force normal to the electrode at a distance from the clamping device equal to 40 times the diameter. The magnitude of the force and the direction of application of force shall be such that the electrode is permanently bent through a 30-degree angle. While bending of the electrode there shall be no evidence of cracking of the copper coating.

10.2 Material composition of rod shall be tested as per standards mentioned in clause no. 8.1.1.1.

10.3 MS pipes shall be tested as per IS:1239.

10.4 Copper bus bars of shall be tested for percentage of copper as per IS:14644.

10.5 Current carrying capacity test on rod electrode shall be done as per clause no. 8.1.1.3 and for concentric pipe electrode as per 8.1.2.7.

10.6 Corrosion Test: As per IS:2119, salt spray test for analysis of effect of corrosion for the specific electrode shall be done through NABL approved testing lab, preferably for 500 hrs. or more.

10.7 Exothermic weld material shall be tested as per provisions of IEEE 837.

10.8 Electrical properties test on conductive mixture as per clause no. 8.1.2.3.

10.9 Physical, chemical & electrical properties test on earth enhancement material as per clause no. 8.2.

10.10 Toxic content tests for cadmium, lead, mercury, hexavalent chromium, polybrominated biphenyls (PBBs) & polybrominated diphenyl ethers (PBDEs) on conductive mixture & earth enhancement material.

Certificates from NABL approved laboratories shall be submitted with test results of above tests. Test certificates shall not be more than three years old.

For dimension, weight and specific resistance average of 3 readings shall be taken. Average value shall be within specified limits and individual values shall not go beyond double of tolerances.

11.0 ACCEPTANCE TESTS

11.1 Following shall constitute acceptance tests and shall be done on 100% sample basis for all the tests mentioned below except where otherwise indicated-

a. Physical check for earth electrode as per clause no. 8.1.1.1 for rod type electrode and as per clause no. 8.1.2.7 for concentric pipe type electrode.
b. Physical check for copper bus bar as per clause no. 8.1.1.2 for rod type electrode and as per clause no. 8.1.2.6 for concentric pipe type electrode.
c. Dimensional and construction feature tests of inspection chamber (Cl. no. 8.4.2)
d. Earth enhancement material as per clause no. 8.2(xviii) & 8.2(xix).
e. Earth resistance measurements as per clause no. 7.0.

11.2 REJECTION:

In case the any component tested and inspected in accordance with this specification, fail to pass the tests or comply with the requirement of the specification, another two component from the same lot shall be inspected in accordance with the specification and if one of them also fail to pass the test, the whole lot of that component shall be rejected subject to the discretion of the purchaser or his nominee.

12.0 INSPECTION:

All the gauges / test & measuring instruments shall be under calibration control at the time of inspection and proof to this office shall be produced.

Inspection and testing shall be carried out by the inspecting authority nominated by the purchaser to ensure that all the requirements of this specification are complied with for the acceptance of the materials offered by the supplier for inspection.

The purchaser or his nominee shall have right of free access to the works of the manufacturer and to be present at all reasonable times and shall be given facilities by the manufacturer to inspect the manufacturing process at any stage of manufacture. He shall have the right to reject whole or part of any work or material that does not conform to the terms of this specification or any other specification or requirement applicable and may order the same to be removed / replaced or altered at the expense of the manufacturer. All reasonable / complete facilities considered necessary by the inspecting authorities for the inspection shall be supplied by the manufacturer free of cost.

The manufacturer shall at his own cost prepare and furnish the necessary test pieces and appliances for such testing as may be carried out at his own premises in accordance with the specification. Failing the existence of facilities at his own premises for the prescribed tests, the manufacturer shall bear the cost of carrying out the tests in an approved laboratory, workshop or test house.

13.0 COMPLETION REPORT & CERTIFICATION:

13.1 The last documents for the completion of the procedure will be submission of the work completion report to the concern Railway authority. After testing the earth values of the pits and proper recording in presence of Railway authority, certified grounding self-adhesive certificate shall be provided for all installations and the same will be displayed / pasted at the place of installation.

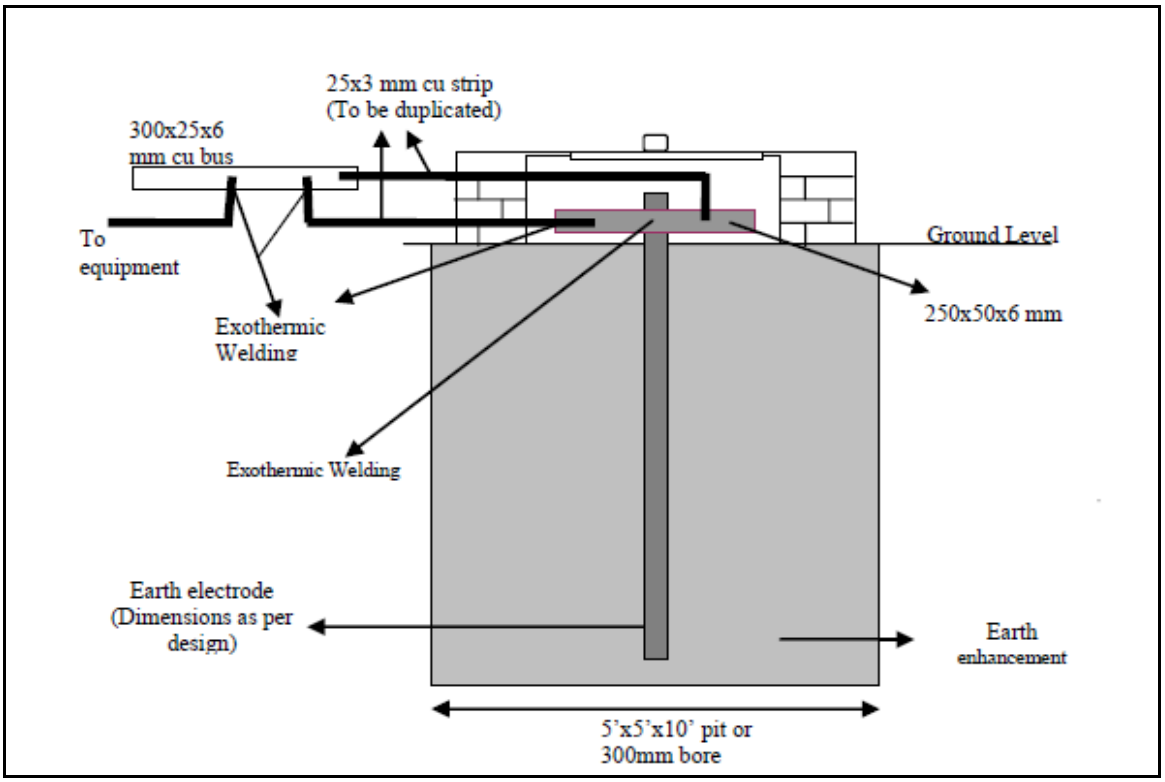
13.2 The complete layout with dimensions of the earthing & bonding system shall be submitted by the supplier in appropriate size (in three copies) after commissioning

showing commissioning date, earth resistance, specification no. and manufacturer's name.

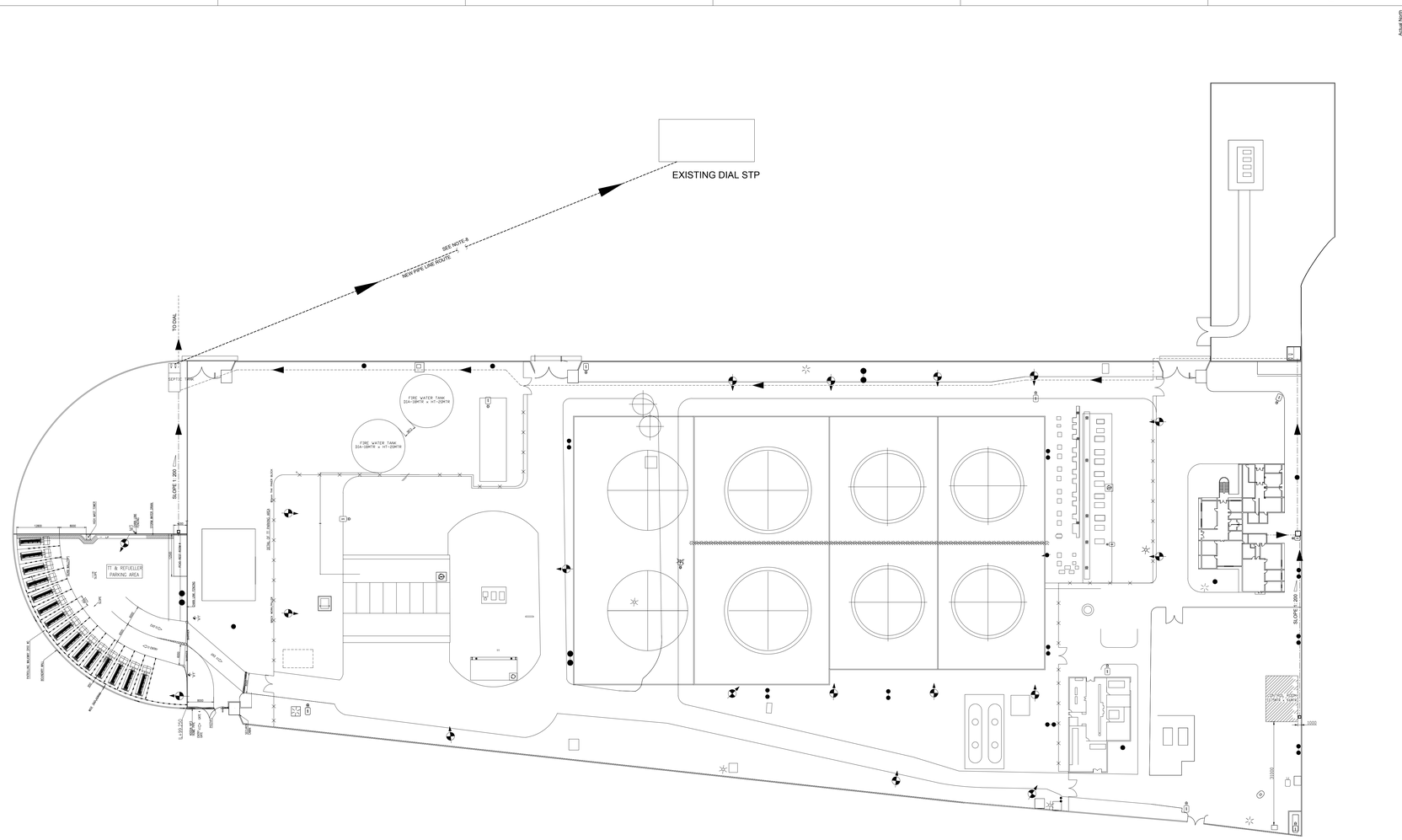
14.0 ANNEXURE - A

General Arrangements for Earth System

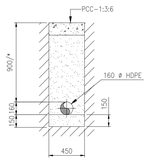
ANNEXURE - A
GENERAL ARRANGEMENTS FOR EARTH SYSTEM



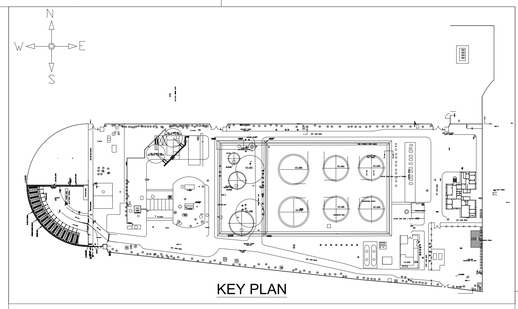
EARTH ELECTRODE INSTALLATION



LAYOUT OF NEW SEWAGE SCHEME



SECTION OF U/G PIPE



KEY PLAN

NOTES

1) ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METERS
2) THIS DRAWING BASED ON SITE SERVE REPORT FOR NEW PIPING ROUTING
3) THIS DRAWING IS BASED ON DAFFPL's DRAWING NO. 322538-MPE-0100-01
4) FGL. 100.0 CORRESPONDS TO FGL. LEVEL SHOWN IN THE SITE GRADING DRAWINGS.THE LOCATION OF THE SEPTIC TANK SHALL BE AS SHOWN IN PLOT PLAN.
5) ALL PIPE LINE NETWORK SHALL BE UNDERGROUND EXCEPT FOR PUMPING PORTION.
6) THE LOCATION OF DIAL STP HAS BEEN TENTATIVELY SHOWN.
7) DEPTH OF U/G PIPE SHALL BE 900 mm. BELOW FGL. FOR PRESSURISED PIPE AND FROM 750MM TO 900MM FOR NON PRESSURISED PIPE.
8) ROUTE OF PIPE LINE FROM SEPTIC TANK TO EXISTING STP SHALL BE AS PER SITE CONDITIONS.

LEGEND :

---------- PE-80/PN6 UNDERGROUND
—·—·—·— PE-63/PN2.5 UNDERGROUND
P SCREW PUMP

REV.	DATE	DESCRIPTION	DRN BY	CHD BY
2	22.09.18	ISSUED FOR REVIEW	MK	KA
1	10.07.18	ISSUED FOR REVIEW	MK	KA
0	05.06.18	ISSUED FOR REVIEW	DMR	KA

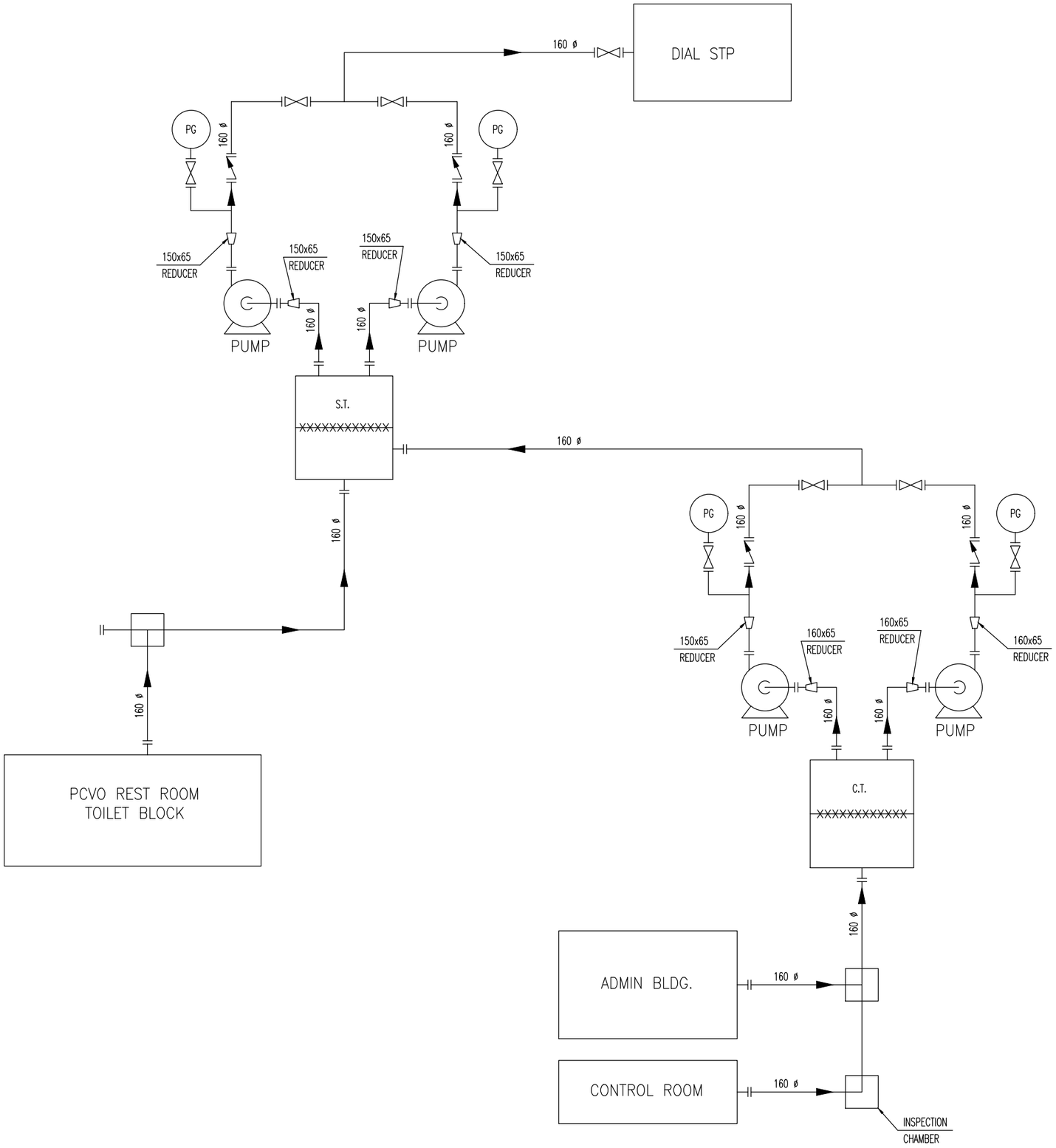
CLIENT : DELHI AVIATION FUEL FACILITY (P) LTD.

PROJECT : MODERNIZATION OF EXISTING FUEL FARM

EPCC : SAGA GLOBAL CONSULTANTS

TITLE : SEWAGE NETWORKING FOR STP

DRAWING No.: DAFFL-DELHI-CV-DR-107 | SHEET: 1/1 | REV. 02 | SCALE : N.T.S



REV.	DATE	DESCRIPTION	DRN BY	CHD BY
0	13.06.18	ISSUED FOR REVIEW	KNP	PP

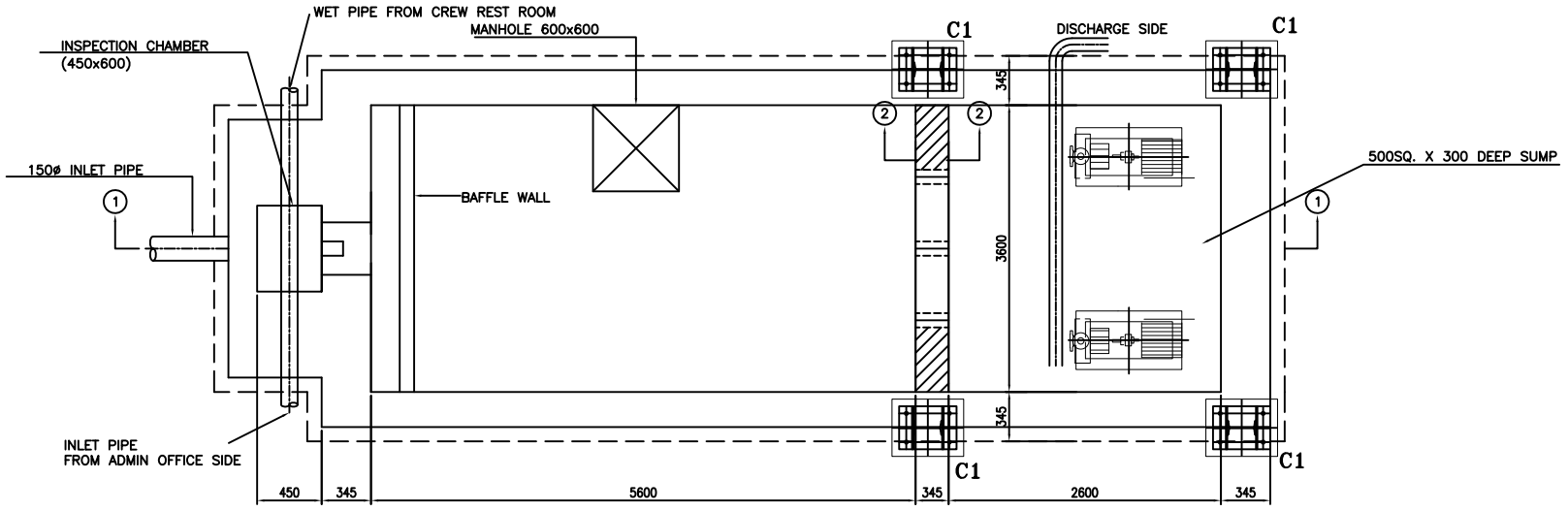
CLIENT : DELHI AVIATION FUEL FACILITY (P) LTD.

PROJECT : MODERNIZATION OF EXISTING FUEL FARM

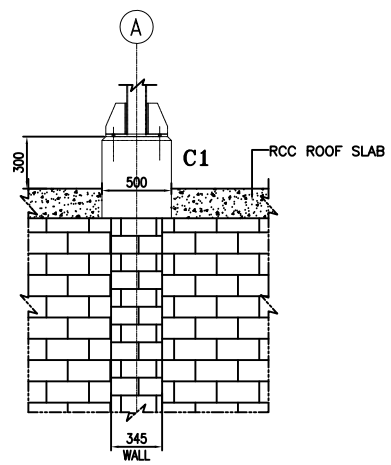
EPCC : SAGA GLOBAL CONSULTANTS

TITLE : PIPING AND INSTRUMENTATION DIAGRAM FOR SEPTIC TANK

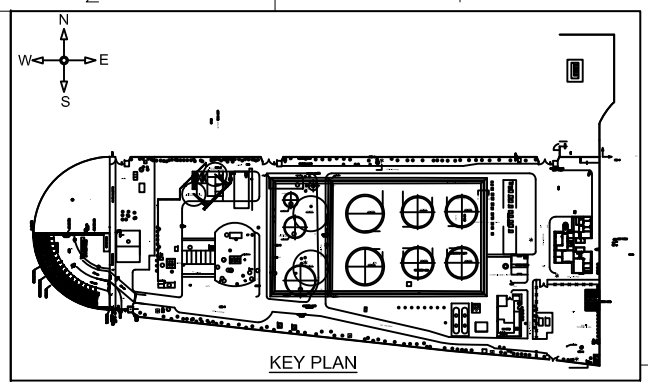
DRAWING No.:	SHEET:	REV.	SCALE :
DAFFL-DELHI-RP-PID-101	1	0	N.T.S



SEPTIC TANK PLAN



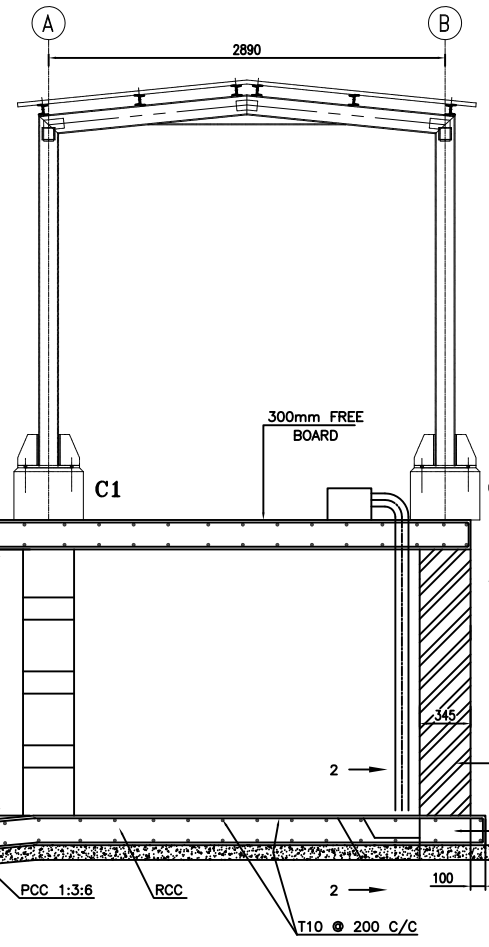
SECTION-2



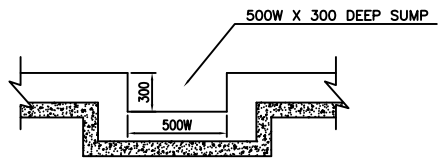
KEY PLAN

NOTES:-

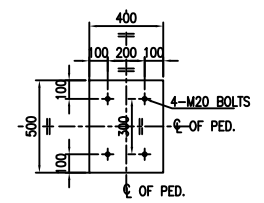
1) ALL DIMENSIONS ARE IN MM,UNLESS NOTED OTHERWISE.
2) CONCRETE SHALL BE CONTROLLED QUALITY AS PER IS : 456-2000. MIX 1:1.5:3
3) BEND, HOOK, COVER & LAP LENGTH SHOULD BE TAKEN AS PER IS : 456-20000
4) PROVIDE INSPECTION CHAMBER AT INLET
5) PROVIDE 150ø PIPE AT INLET
6) TOP LEVEL OF COVER SLAB SHALL BE SUIT AT SITE.
7) FGL. 100.0 CORRESPONDS TO FGL. LEVEL SHOWN IN THE SITE GRADING DRAWINGS. THE LOCATION OF THE SEPTIC TANK SHALL BE AS SHOWN IN PLOT PLAN.
8) MS RUNGS,MANHOLE COVER & SUMP TO BE PROVIDED SUITABLY.



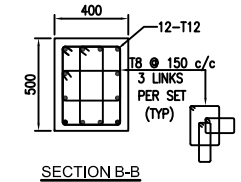
SECTION-1



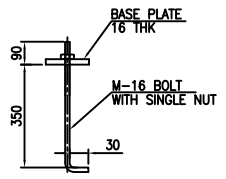
SECTION-2



VIEW A-A
(SHOWING BOLT ARRANGEMENT)



SECTION B-B
(SHOWING REBAR ARRANGEMENT)



FOUNDATION BOLT DETAIL

REFERENCE DRAWINGS		
NOS.	DESCRIPTION	DRAWING NOS.
1	OVERALL PLOT PLAN FOR FUEL FARM	DAFFL-DELHI-CV-DR-104-1
2	STRUCTURE G.A. FOR SEPTIC TANK	DAFFL-DELHI-CV-DR-105-1

REV.	DATE	DESCRIPTION	DRN BY	CHD BY
0	30.04.18	ISSUED FOR REVIEW	MK	KA

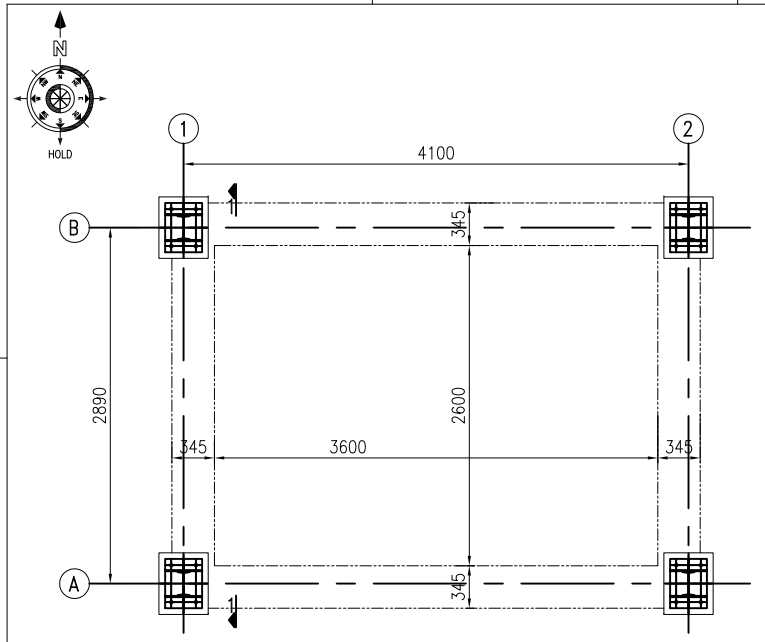
CLIENT : DELHI AVIATION FUEL FACILITY (P) LTD.

PROJECT : MODERNIZATION OF EXISTING FUEL FARM

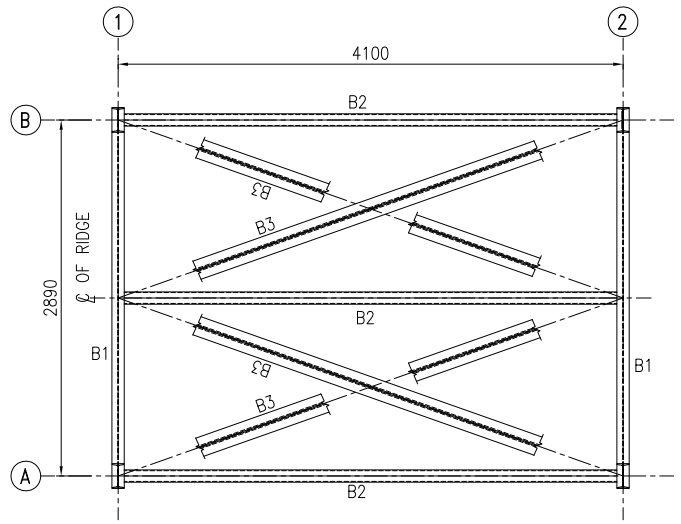
EPCC : SAGA GLOBAL CONSULTANTS

TITLE : TYP. SEPTIC TANK DETAILS

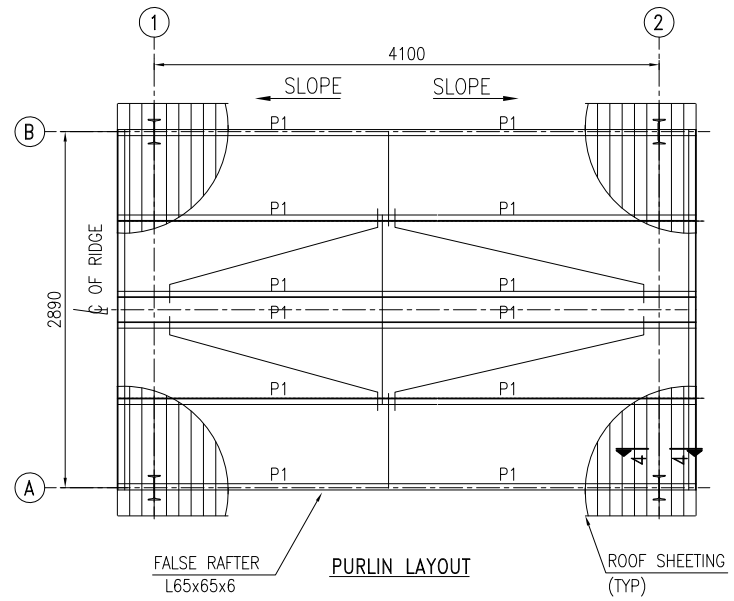
DRAWING No.: DAFFL-DELHI-CV-DR-105 | SHEET:1/1 | REV.00 | SCALE :N.T.S



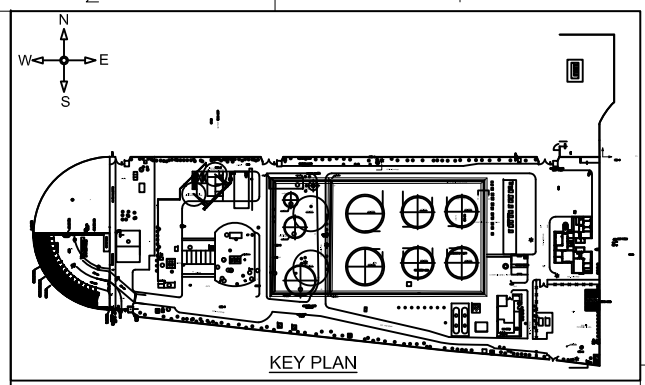
LAYOUT OF BASE PLATES



PLAN AT RAFTER LEVEL



PURLIN LAYOUT



GENERAL NOTES:

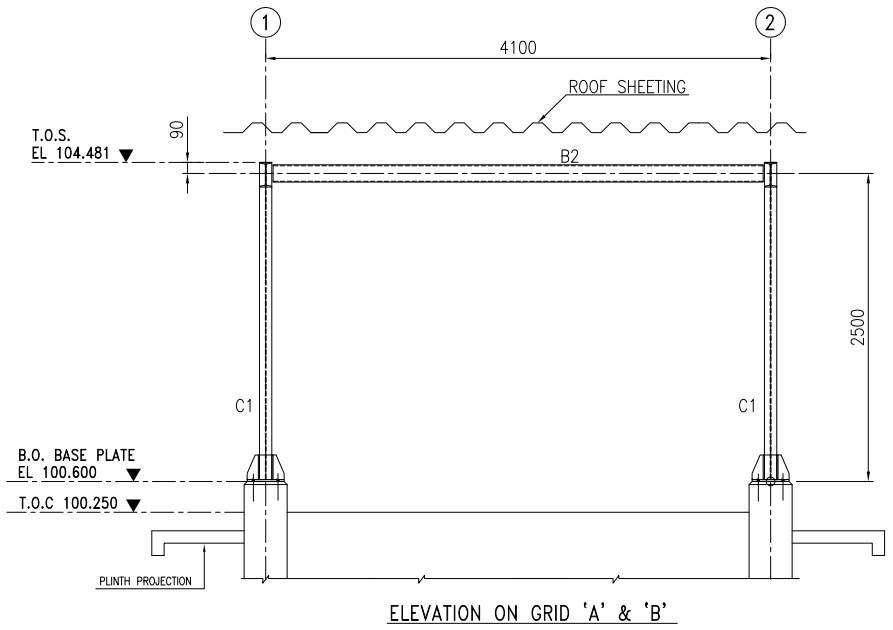
1. ALL DIMENSIONS ARE IN MILLIMETERS & LEVELS ARE IN METERS.
2. DRAWING SHOULD NOT BE SCALED. ONLY WRITTEN DIMENSION TO BE FOLLOWED.
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS.
4. MEASURE & CONFIRM ACTUAL DIMENSIONS & ELEVATIONS AT SITE BEFORE CONSTRUCTION. IN CASE OF ANY DISCREPANCY THE SAME SHALL BE INFORMED AND CONFIRMED WITH SITE IN CHARGE & CONSULTANT.

LEGENDS:

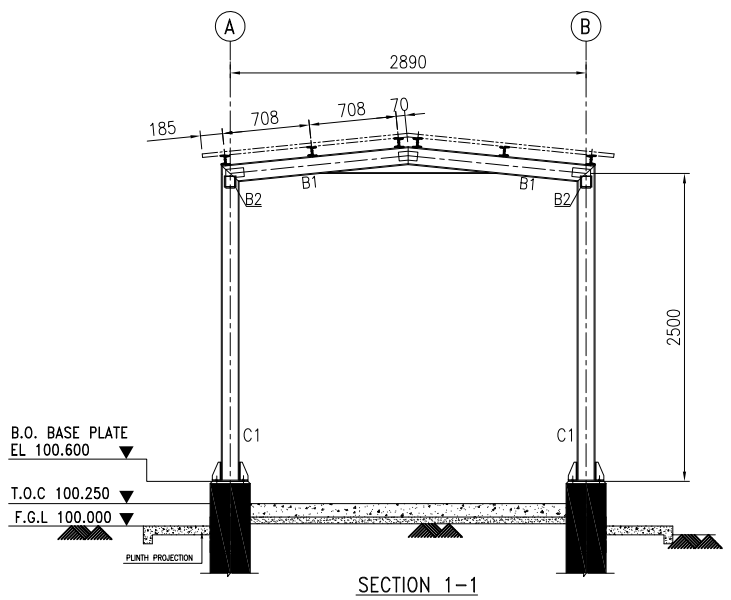
F.G.L.	–	FINISH GROUND LEVEL
F.F.L.	–	FINISH FLOOR LEVEL
T.O.S.	–	TOP OF STEEL
TYP	–	TYPICAL
C/C	–	CENTER TO CENTER
N	–	NORTH
E	–	EAST
B.O.S	–	BOTTOM OF STEEL
EL	–	ELEVATION
T.O.C	–	TOP OF CONCRETE

REFERENCE DRAWINGS

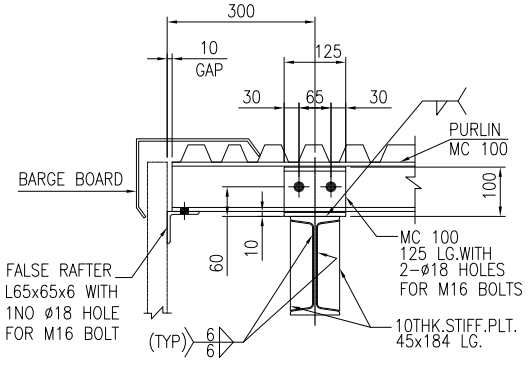
NOS.	DESCRIPTION	DRAWING NOS.
1	OVERALL PLOT PLAN FOR FUEL FARM	DAFFL-DELHI-CV-DR-104-1
2	TYP. SEPTIC TANK DETAILS	DAFFL-DELHI-CV-DR-105



ELEVATION ON GRID 'A' & 'B'



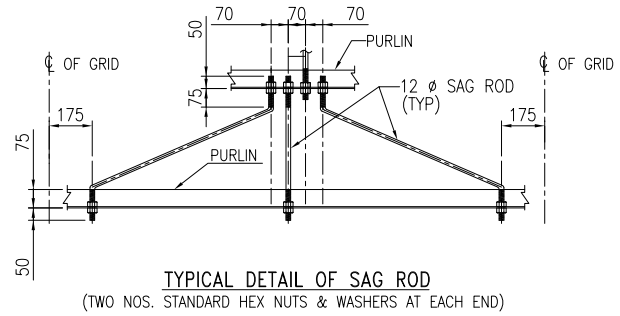
SECTION 1–1



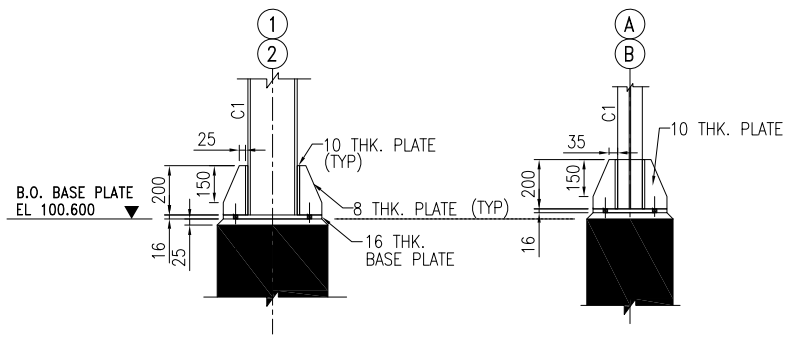
SECTION 4–4

MEMBER SCHEDULE

MEMBER MARK.	DESCRIPTION	SECTION
B1	ISMB 200	I
B2	MC 100 BOX	□
B3	2ISA 65x65x8	+
C1	ISMB 200	I
P1	ISMC 100	ɔ

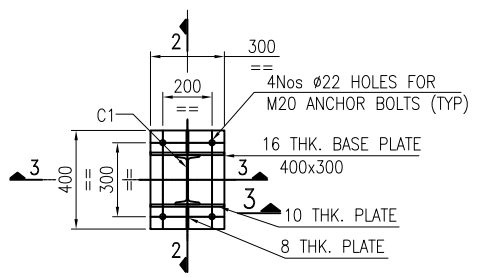


TYPICAL DETAIL OF SAG ROD
(TWO NOS. STANDARD HEX NUTS & WASHERS AT EACH END)



SECTION 2–2

SECTION 3–3



DETAILS OF BASE PLATE

REV.	DATE	DESCRIPTION	DRN BY	CHD BY
0	27.08.18	ISSUED FOR REVIEW	NSA	KA

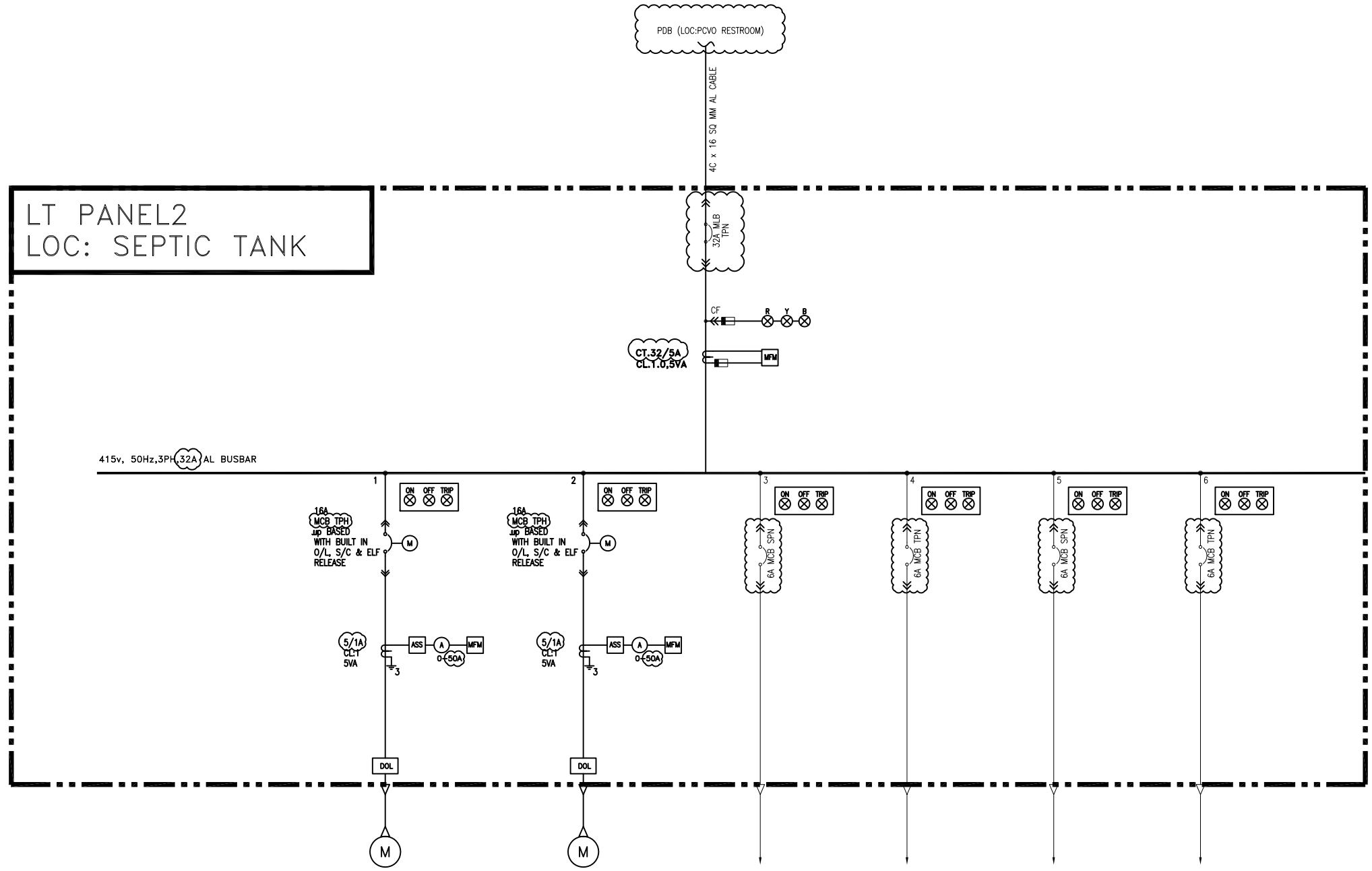
CLIENT : DELHI AVIATION FUEL FACILITY (P) LTD.

PROJECT : MODERNIZATION OF EXISTING FUEL FARM

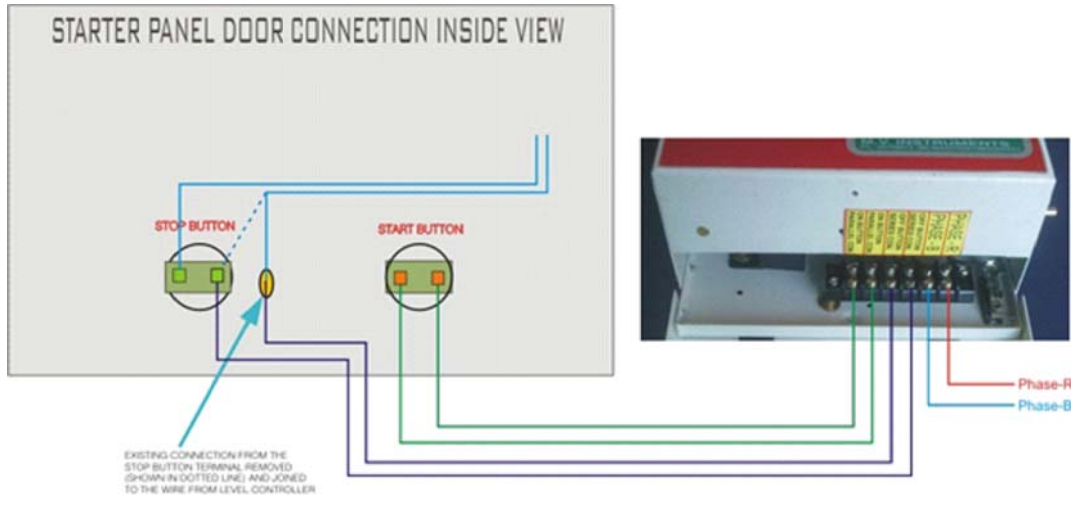
EPCC : SAGA GLOBAL CONSULTANTS

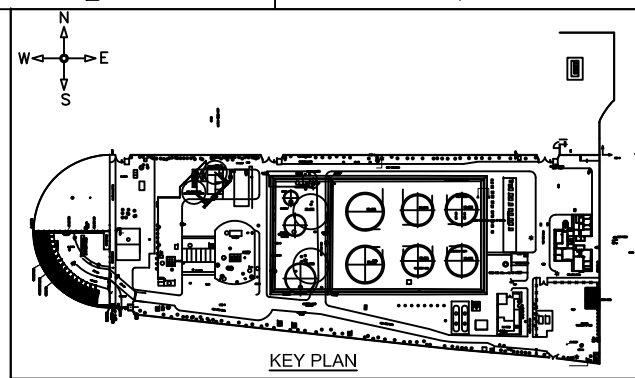
TITLE : STRUCTURE G.A. FOR SEPTIC TANK

DRAWING No.:DAFFL-DELHI-CV-DR-105-1 | SHEET:1/1 | REV.0 | SCALE :N.T.S



CABLE SIZE	3C x 4 SQMM	3C x 4 SQMM	–	4C x 2.5 SQMM	4C x 2.5 SQMM	–	–
RATING (KW)	3.70	3.70	32A TPN MCB	6A SPN MCB	6A TPN MCB	6A SPN MCB	6A TPN MCB
FEEDER TYPE	DOL STARTER	DOL STARTER					
TAG NO./ DESCRIPTION	SEPTIC TANK PUMP1 MOTOR & WATER LEVEL CONTROLLER	SEPTIC TANK PUMP2 MOTOR	INCOMER	LIGHTING FOR SEPTIC TANK	SPARE	SPARE	SPARE





KEY PLAN

Power Connection from the (415V AC) Three Phase Starter to the Water Level Controller.

The Water Level Controller system will have a 6 way terminal block for power terminations mounted as shown in the Photo for the Borewell Motor. Connecting the Level Controller to such starter is explained in steps as follows.

STEP 1. Isolate the Main Power Supply before the Power Connection Procedure and open the door of the Starter.

STEP 2. Identify two terminals of starter "ON Button" usually a Green Push switches mounted on the door of the starter.

STEP 3. Identify two terminals of starter "OFF Button" usually a Red Push switches mounted on the door of the starter (some times only a push knob will be on the door and switch will be a part of the contactor block inside the panel).

STEP 4. Identify the Power Terminal Block with sticker of connection details in Water Level Controller.

STEP 5. Connect two wires, to "ON BUTTON PARALLEL CON." terminals of 6 way terminal block of Level Controller to the two terminals of ON button (i.e. Connect in parallel) without disturbing existing starter wires as shown in the diagram.

STEP 6. Connect two wires from "OFF BUTTON SERIES CON." of Level Controller to the two terminals of OFF button in series, as shown in the diagram, i.e.

STEP 6a. Remove the wire from any one of the OFF button terminal and join it with one of the "OFF BUTTON SERIES CON." terminal.

STEP 6b. Another "OFF BUTTON SERIES CON." terminal of the Level Controller has to be connected to stop button terminal from where wire was removed In step 6a.

STEP 7. Connect Phase R and Phase B to the power input terminals PHASE-R and PHASE-B.

STEP 8. Put the Auto/Manual Switch of Level Controller to Manual Mode and operate the ON and OFF button to Confirm that the motor in working in Manual Mode.

STEP 9. Now the power connection can be considered completed. Switch OFF the Mains Power and put a layer of insulation tape on top of terminal blocks to avoid any contact of sensing cables with power terminal block.

NOTES:–

1. MOTOR FEEDER WITH DOL STARTER SHALL BE COMPRISING MPCB (WITH IN BUILT O/L RELAY) CONTACTOR WITH BUILT IN SINGLE PHASING PROTECTION FEATURE.
2. LV MOTOR STARTER COMPONENTS RATING SHALL BE AS PER TYPE – 2 CO-ORDINATION OF IEC-60947.
3. CT/PT VA (BURDAN) RATING SHALL BE CONFIRMED BY VENDOR.
4. MOTOR RATING FOR PUMPS CONSIDERED TENTATIVELY AND SHALL BE CONFIRMED AFTER RECEIPT OF VENDOR DATA.
5. WATER LEVEL CONTROLLER WILL HAVE TWO SET OFF SIX TERMINAL, ONE FOR MAIN MOTOR AND OTHER STAND BY MOTOR.

REV.	DATE	DESCRIPTION	DRN BY	CHD BY
1	31.08.18	RE ISSUED FOR TENDER	NSA	PBS
0	13.07.18	ISSUED FOR REVIEW	MK	PBS

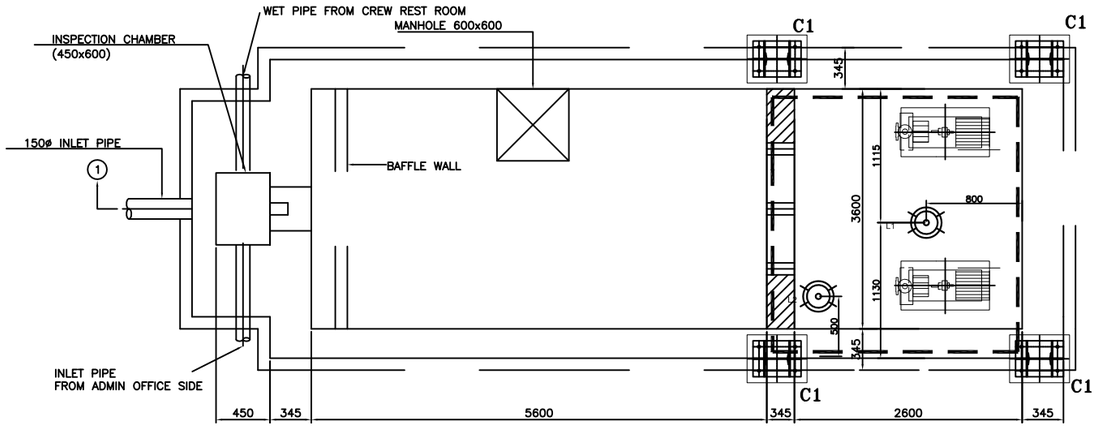
CLIENT : DELHI AVIATION FUEL FACILITY (P) LTD.

PROJECT : MODERNIZATION OF EXISTING FUEL FARM

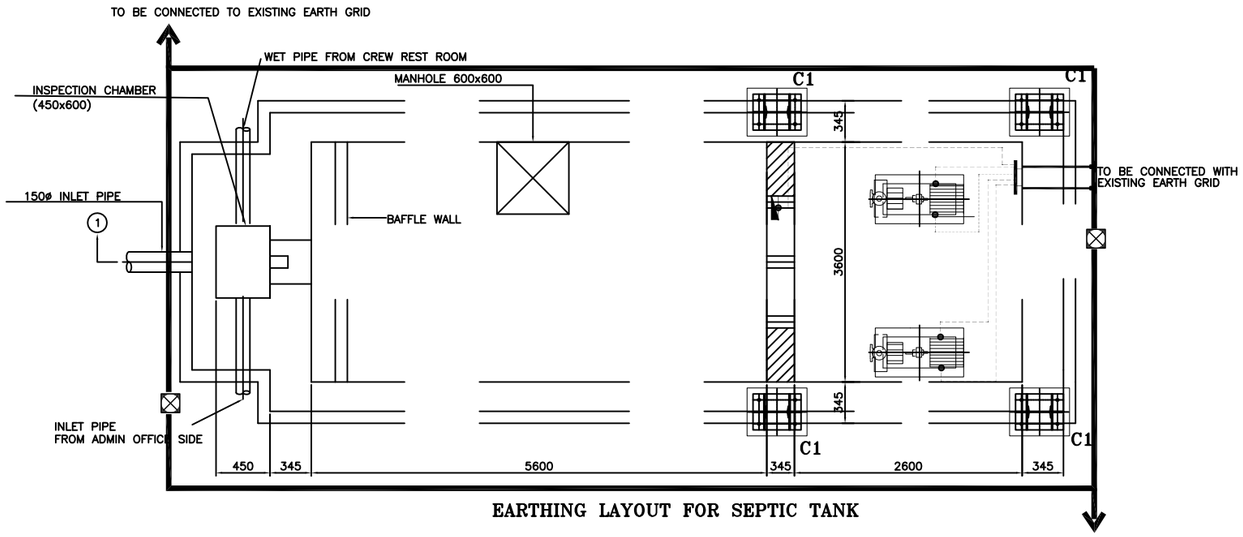
EPCC : SAGA GLOBAL CONSULTANTS

TITLE : SINGLE LINE DIAGRAM FOR SEPTIC TANK

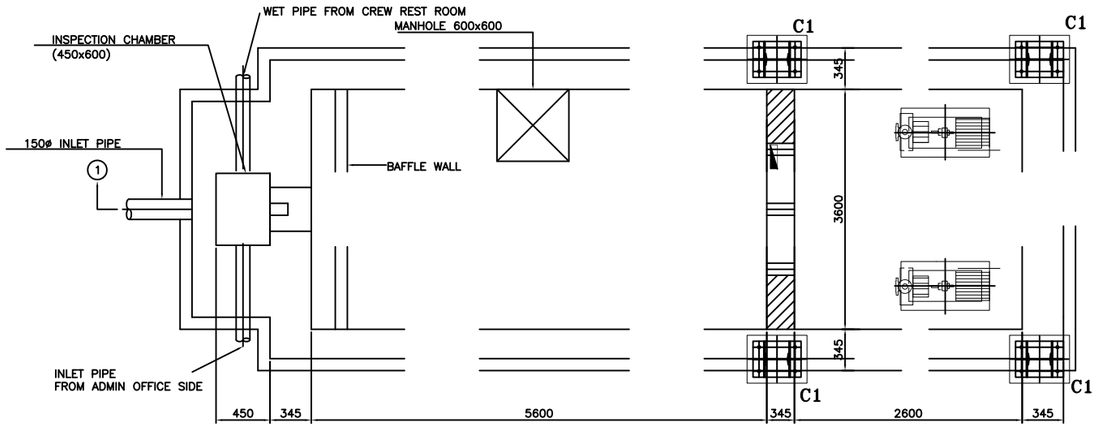
DRAWING No.: DAFFL-DELHI-EL-SD-105 | SHEET: 1/1 | REV. 1 | SCALE : N.T.S



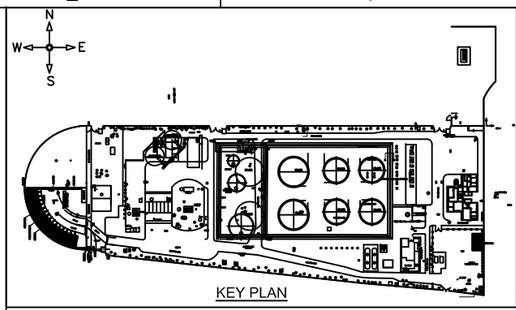
LIGHTING FOR SEPTIC TANK



EARTHING LAYOUT FOR SEPTIC TANK



POWER LAYOUT FOR SEPTIC TANK



KEY PLAN

LEGEND:-

SR.NO	SYMBOL	DESCRIPTION	QTY
1		36W LED WELL GLASS LIGHTING FIXTURE	2 NO
2		ELECTRICAL EARTH PIT (EEP)	2 NO
3		LT PANEL 2	1 NO
4		100MM PERFORATED TRAY	15 MTR
5		50x6MM GI STRIP	40 MTR
6		NO 8 SWG SOLID GI WIRE	15 MTR
7		CAD WELD BRANCH CONNECTION	2 NOS.
8		EARTHING LUGS	5 NOS.
9	EB	EARTHING BUS BAR	1 NOS.

NOTES:-

1. LOCATION OF LIGHTING FIXTURES AND LV PANEL ARE SUGGESTIVE ONLY. THE EXACT LOCATION SHALL BE DECIDED AT SITE CONSIDERING THE OBSTRUCTION, IF ANY
2. LOCATION OF EARTH BUS & ROUTING OF EARTHING STRIPS/CABLE ARE INDICATIVE ONLY. THE LOCATION/ROUTE SHALL BE DECIDED AT THE SITE CONSIDERING OBSTRUCTION, IF ANY.
3. POWERING OF LV PANEL SHALL BE FROM PDB LOCATED AT PCVO REST ROOM.
4. THE CONNECTION OF EARTHING GRID TO EXISTING EARTH GRID SHALL BE IN THE SCOPE OF CONTRACTOR.
5. CONTRACTOR TO MAKE ARRANGEMENT FOR MOUNTING THE LV PANEL.

REV.	DATE	DESCRIPTION	DRN BY	CHD BY
1	31.08.18	RE ISSUED FOR TENDER	NSA	PBS
0	13.07.18	ISSUED FOR REVIEW	MK	PBS

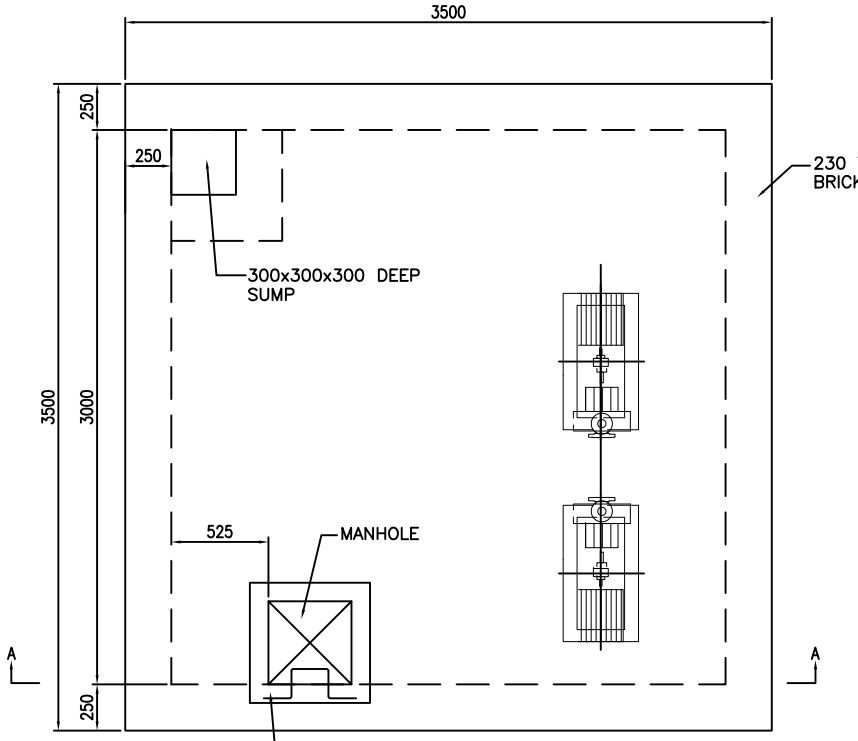
CLIENT : DELHI AVIATION FUEL FACILITY (P) LTD.

PROJECT : MODERNIZATION OF EXISTING FUEL FARM

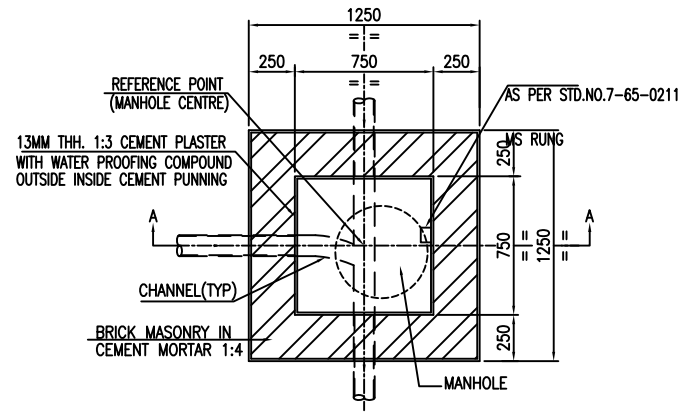
EPCC : SAGA GLOBAL CONSULTANTS

TITLE : POWER,LIGHTING & EARTHING LAYOUT FOR SEPTIC TANK

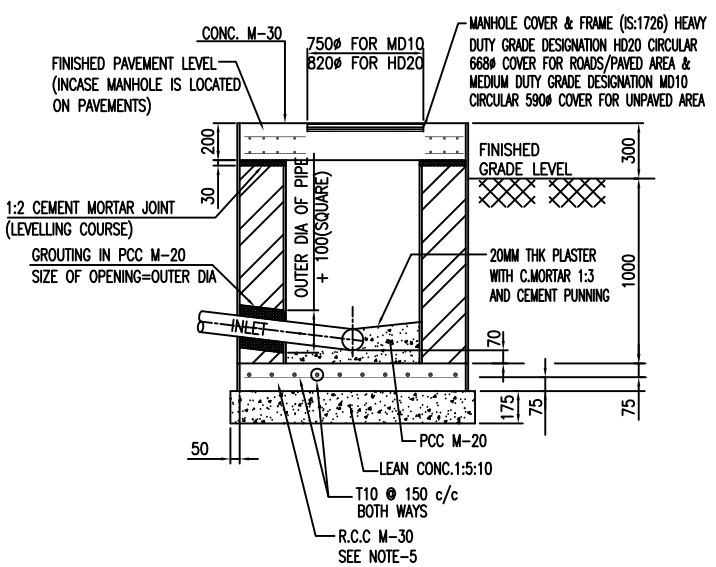
DRAWING No.: DAFFL-DELHI-EL-LY-105 | SHEET: 1/1 | REV. 1 | SCALE : N.T.S



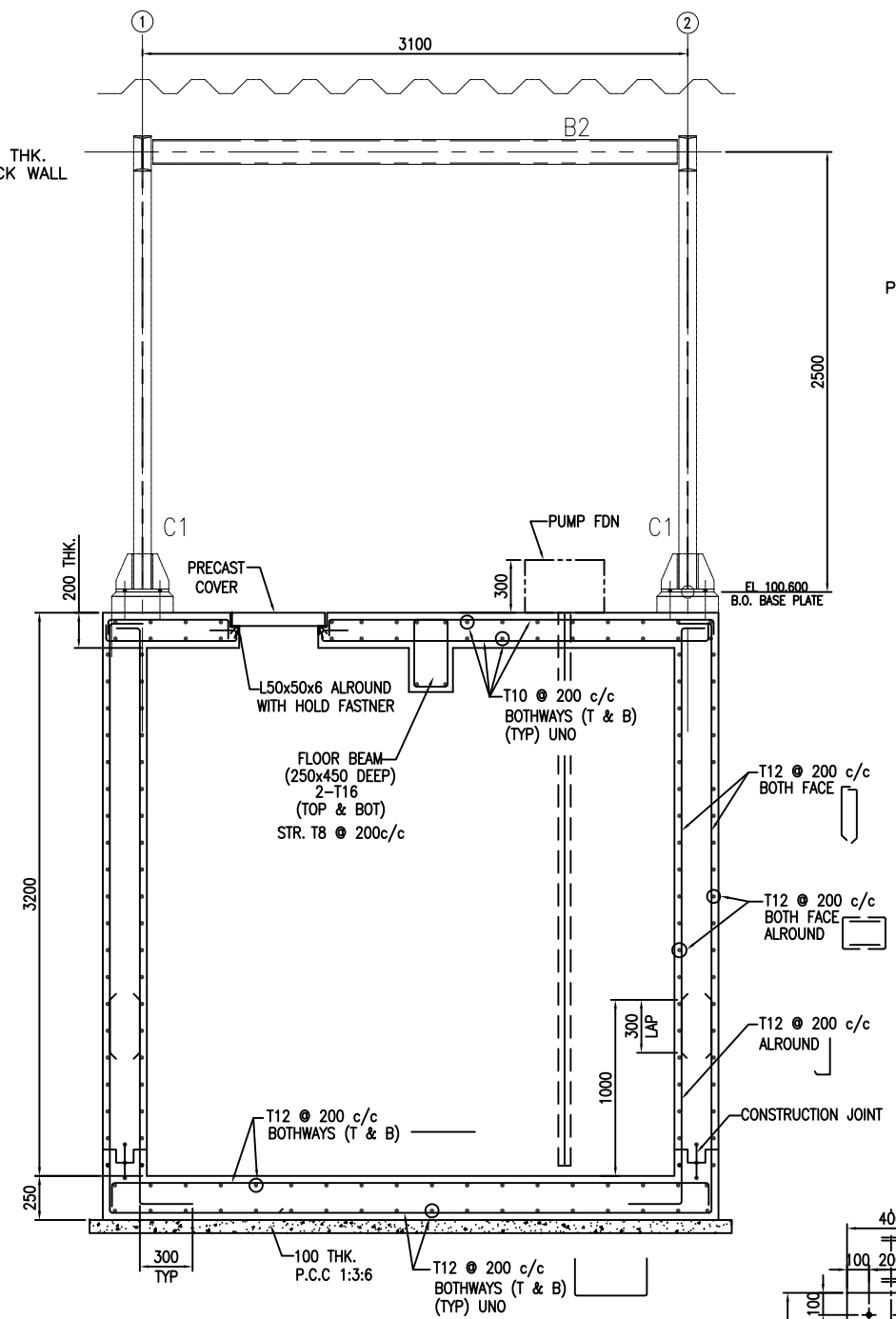
PLAN FOR COLLECTION PIT



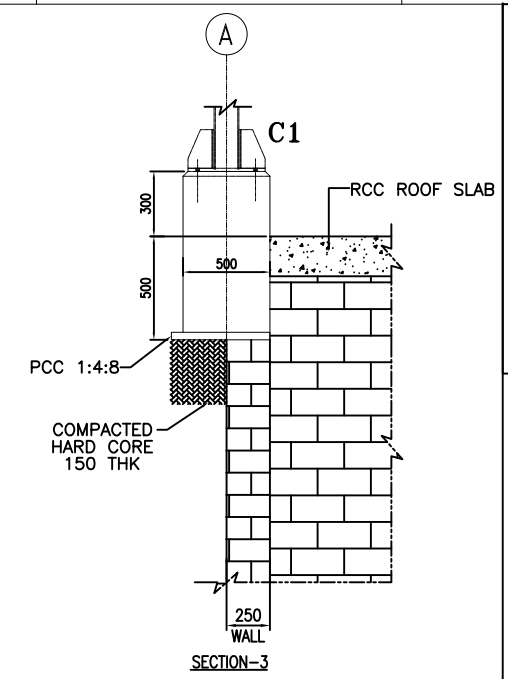
PLAN FOR INSPECTION CHEMBER
(FOR⌀<300)



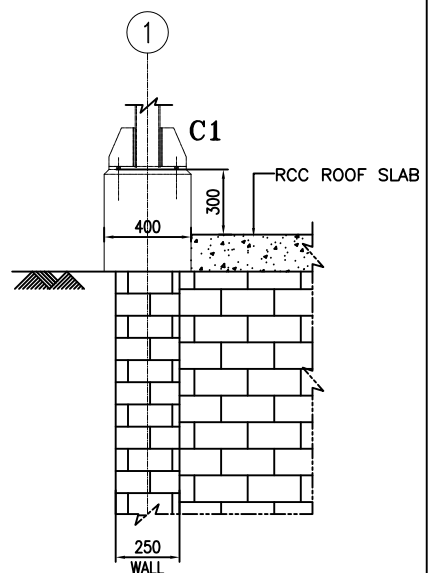
SECTION B-B



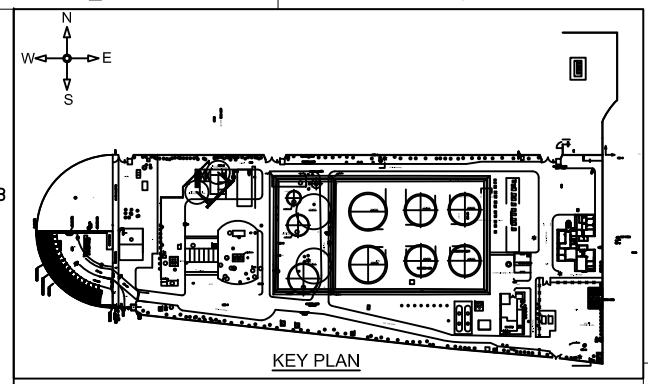
SECTION A-A



SECTION-3



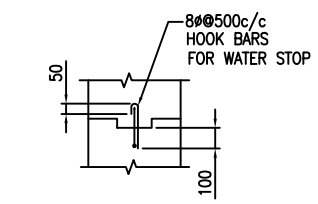
SECTION-2



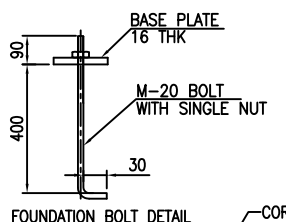
KEY PLAN

NOTES:-

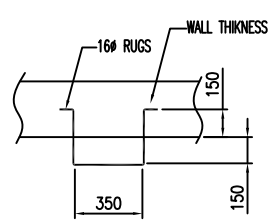
1) ALL DIMENSIONS ARE IN MM,UNLESS NOTED OTHERWISE.
2) CONCRETE SHALL BE CONTROLLED QUALITY AS PER IS : 456-2000. MIX 1:1.5:3
3) BEND, HOOK, COVER & LAP LENGTH SHOULD BE TAKEN AS PER IS : 456-20000
4) PROVIDE INSPECTION CHAMBER AT INLET
5) PROVIDE 150⌀ PIPE AT INLET
6) TOP LEVEL OF COVER SLAB SHALL BE SUIT AT SITE.
7) FGL. 100.0 CORRESPONDS TO FGL. LEVEL SHOWN IN THE SITE GRADING DRAWINGS. THE LOCATION OF THE SEPTIC TANK SHALL BE AS SHOWN IN PLOT PLAN.



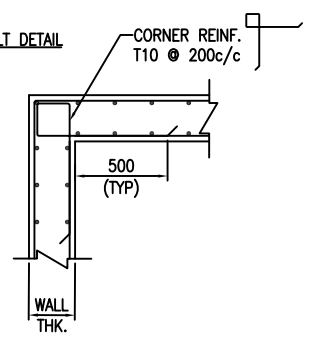
DETAIL OF WATER STOP ALROUND



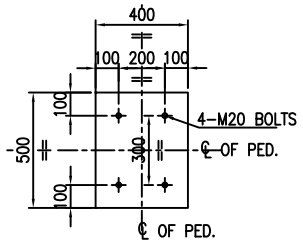
FOUNDATION BOLT DETAIL



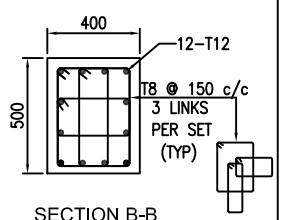
TYP. DETAIL OF RUG



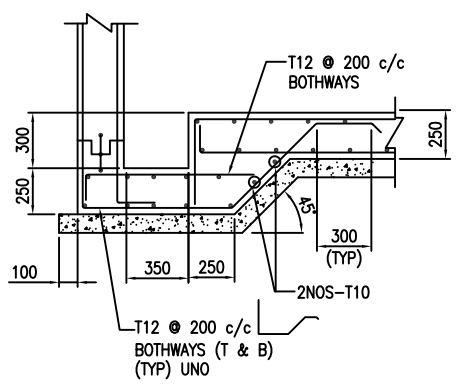
TYPICAL CORNER REINF. DETAIL



VIEW A-A
(SHOWING BOLT ARRANGEMENT)



SECTION B-B
(SHOWING REBAR ARRANGEMENT)



TYPICAL DETAIL OF SUMP

REV.	DATE	DESCRIPTION	DRN BY	CHD BY
0	30.08.18	ISSUED FOR REVIEW	NSA	KA

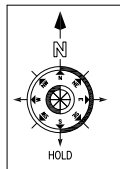
CLIENT : DELHI AVIATION FUEL FACILITY (P) LTD.

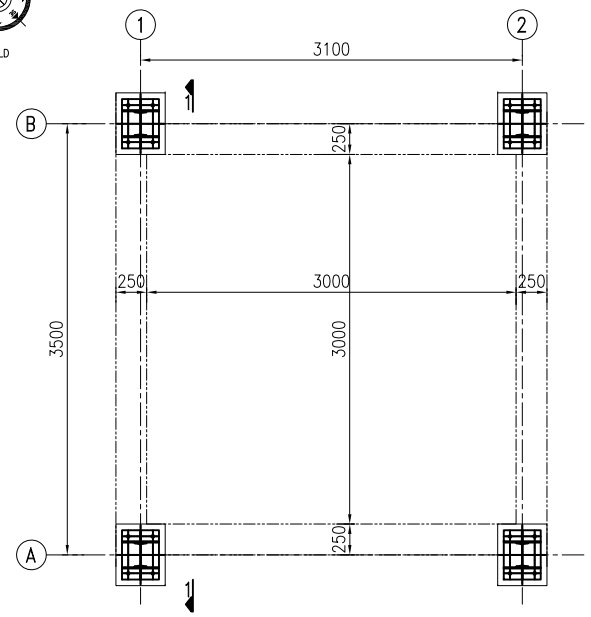
PROJECT : MODERNIZATION OF EXISTING FUEL FARM

EPCC : SAGA GLOBAL CONSULTANTS

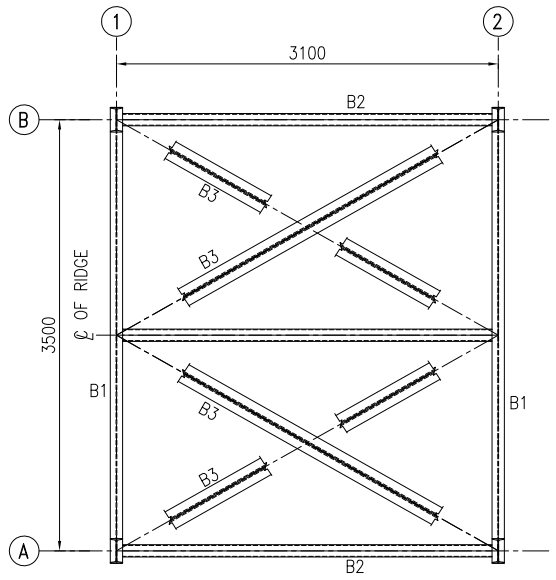
TITLE : DETAILS OF COLLECTION PIT & INSPECTION CHAMBER

DRAWING No.: DAFFL-DELHI-CV-DR-106 | SHEET:1/1 | REV.00 | SCALE :N.T.S

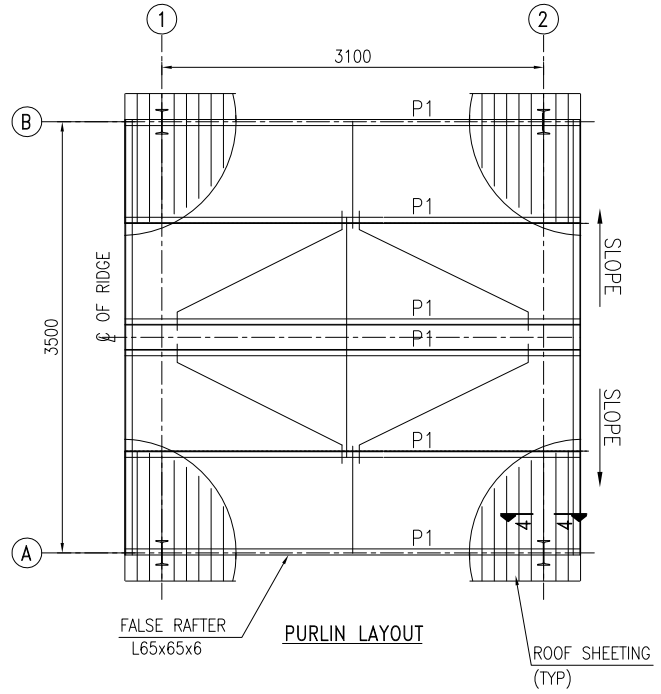




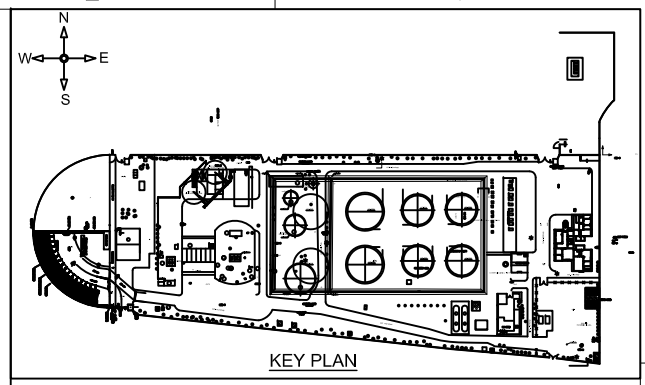
LAYOUT OF BASE PLATES



PLAN AT RAFTER LEVEL



PURLIN LAYOUT



KEY PLAN

GENERAL NOTES:

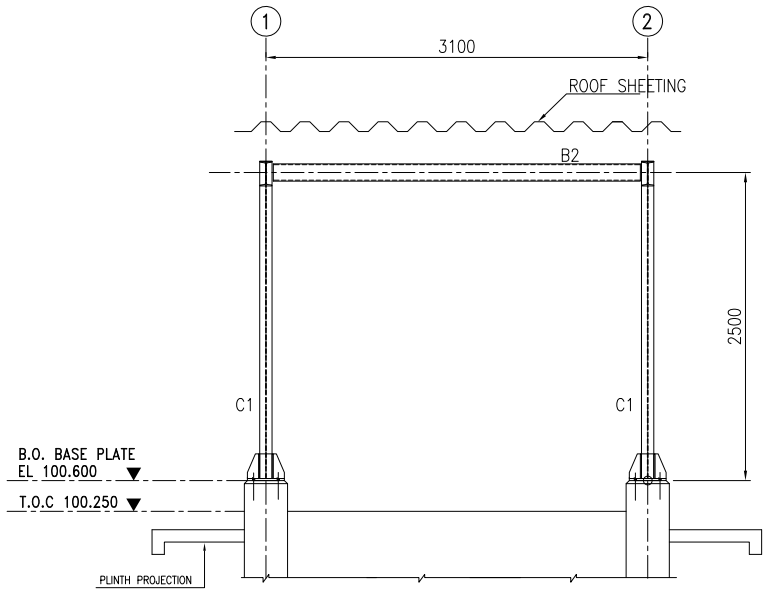
1. ALL DIMENSIONS ARE IN MILLIMETERS & LEVELS ARE IN METERS.
2. DRAWING SHOULD NOT BE SCALED. ONLY WRITTEN DIMENSION TO BE FOLLOWED.
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS.
4. MEASURE & CONFIRM ACTUAL DIMENSIONS & ELEVATIONS AT SITE BEFORE CONSTRUCTION. IN CASE OF ANY DISCREPANCY THE SAME SHALL BE INFORMED AND CONFIRMED WITH SITE IN CHARGE & CONSULTANT.

LEGENDS:

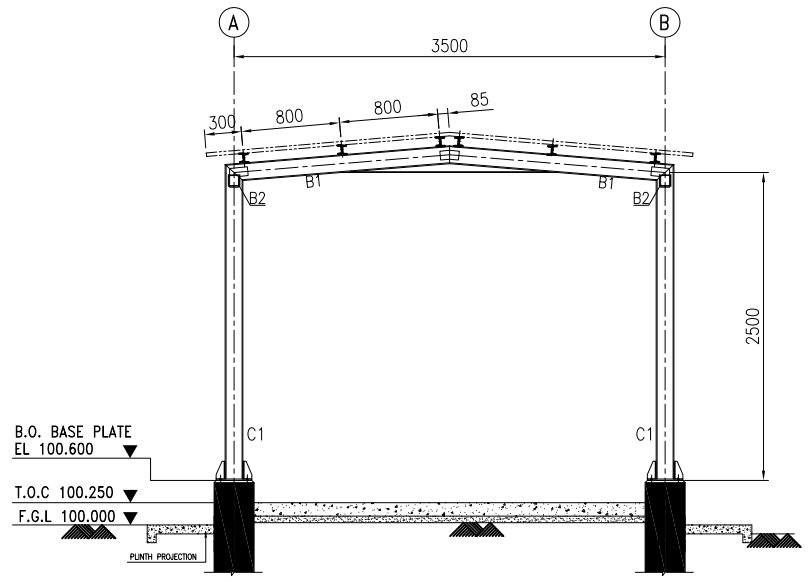
F.G.L.	– FINISH GROUND LEVEL
F.F.L.	– FINISH FLOOR LEVEL
T.O.S.	– TOP OF STEEL
TYP	– TYPICAL
C/C	– CENTER TO CENTER
N	– NORTH
E	– EAST
B.O.S	– BOTTOM OF STEEL
EL	– ELEVATION
T.O.C	– TOP OF CONCRETE

REFERENCE DRAWINGS

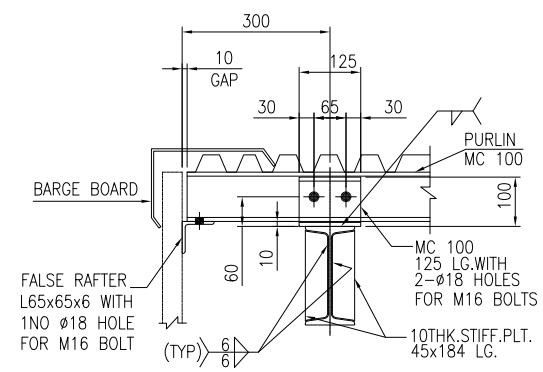
NOS.	DESCRIPTION	DRAWING NOS.
1	OVERALL PLOT PLAN FOR FUEL FARM	DAFFL-DELHI-CV-DR-104-1
2	TYP. DETAILS OF COLLECTION PIT & INSPECTION CHAMBER	DAFFL-DELHI-CV-DR-106



ELEVATION ON GRID 'A' & 'B'



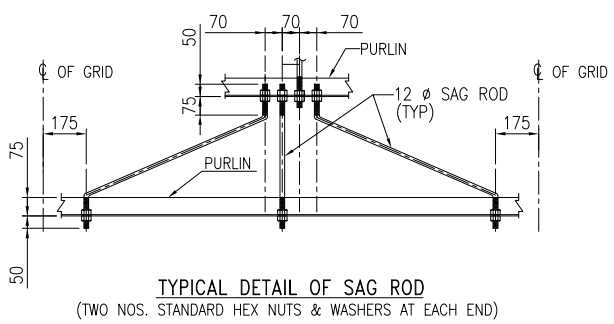
SECTION 1–1



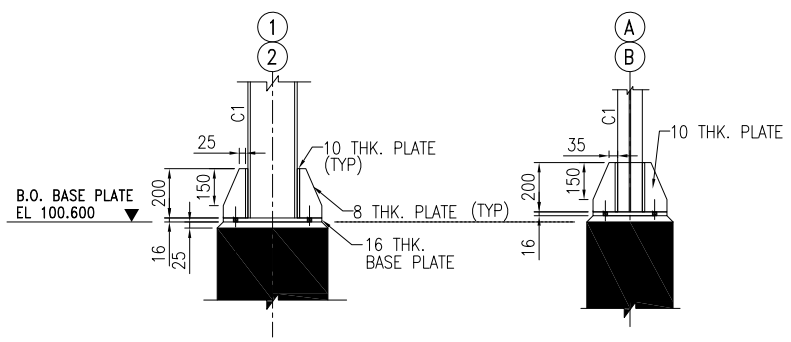
SECTION 4–4

MEMBER SCHEDULE

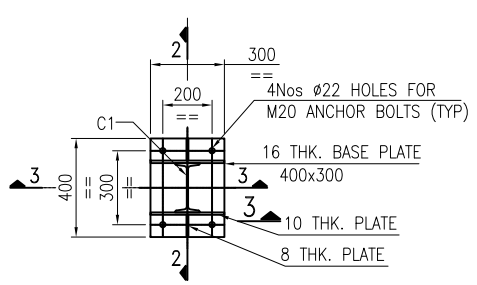
MEMBER MARK.	DESCRIPTION	SECTION
B1	ISMB 200	I
B2	MC 100 BOX	□
B3	2ISA 65x65x8	+
C1	ISMB 200	I
P1	ISMC 100	ɔ



TYPICAL DETAIL OF SAG ROD
(TWO NOS. STANDARD HEX NUTS & WASHERS AT EACH END)



SECTION 2–2 SECTION 3–3



DETAILS OF BASE PLATE

REV.	DATE	DESCRIPTION	DRN BY	CHD BY
0	27.08.18	ISSUED FOR REVIEW	NSA	KA

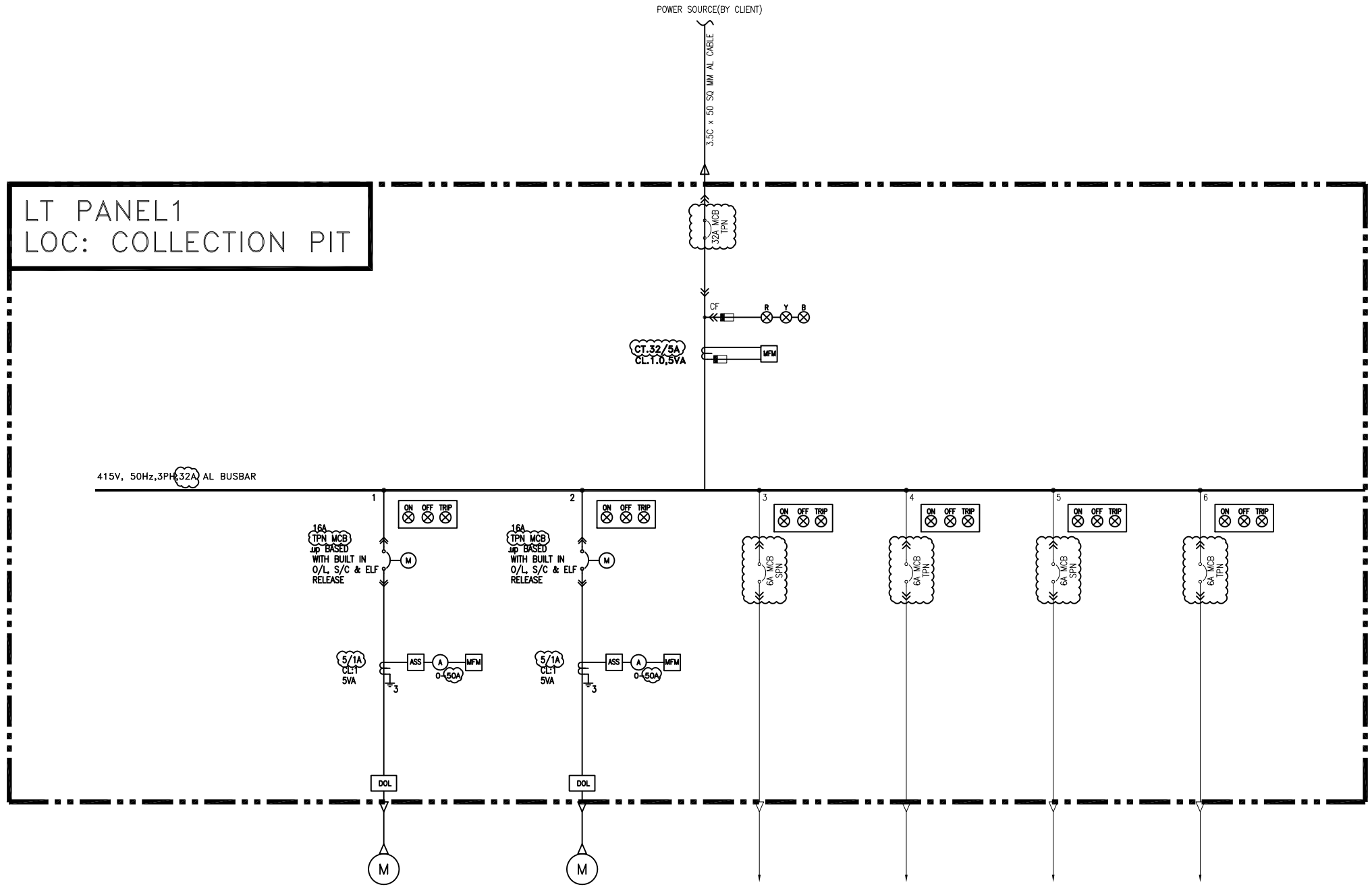
CLIENT : DELHI AVIATION FUEL FACILITY (P) LTD.

PROJECT : MODERNIZATION OF EXISTING FUEL FARM

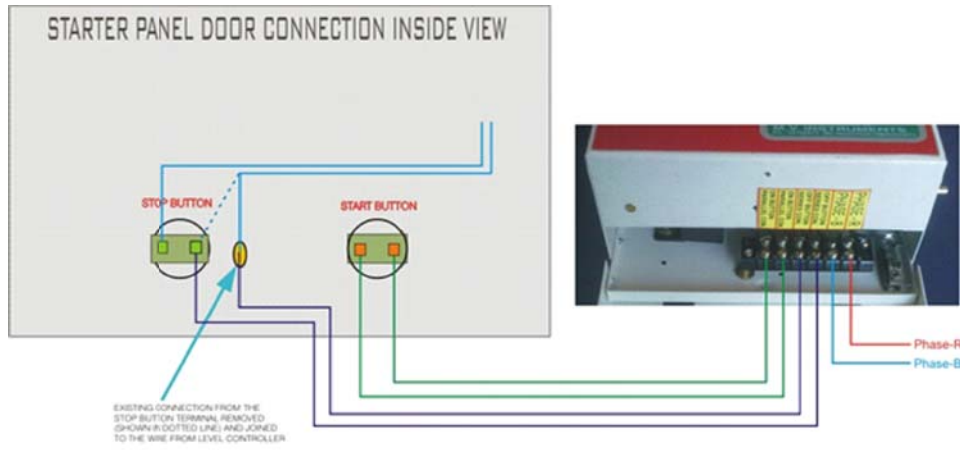
EPCC : SAGA GLOBAL CONSULTANTS

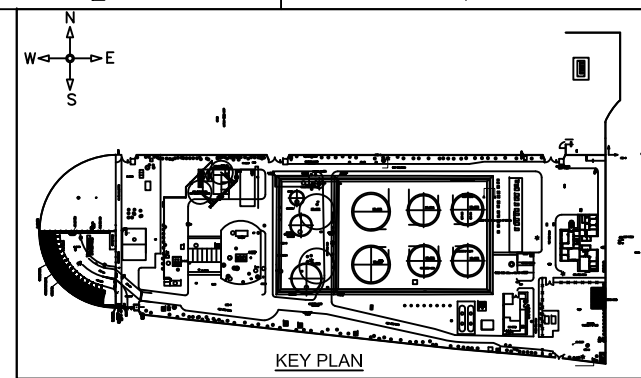
TITLE : STRUCTURE G.A. FOR COLLECTION PIT AND INSPECTION CHAMBER

DRAWING No.:DAFFL-DELHI-CV-DR-106-1 | SHEET:1/1 | REV.0 | SCALE :N.T.S



CABLE SIZE	3C x 4 SQMM	3C x 4 SQMM	–	4C x 2.5 SQMM	4C x 2.5 SQMM	–	–
RATING (KW)	3.70	3.70	32A	6A	6A	6A	6A
FEEDER TYPE	DOL STARTER	DOL STARTER	TPN MCB	SPN MCB	TPN MCB	SPN MCB	TPN MCB
TAG NO./ DESCRIPTION	COLLECTION PIT PUMP1 MOTOR & WATER LEVEL CONTROLLER	COLLECTION PIT PUMP2 MOTOR	INCOMER	LIGHTING FOR COLLECTION PIT	SPARE	SPARE	SPARE





KEY PLAN

Power Connection from the (415V AC) Three Phase Starter to the Water Level Controller.

The Water Level Controller system will have a 6 way terminal block for power terminations mounted as shown in the Photo for the Borewell Motor. Connecting the Level Controller to such starter Is explained In steps as follows.
STEP 1. Isolate the Main Power Supply before the Power Connection Procedure and open the door of the Starter.
STEP 2. Identify two terminals of starter "ON Button" usually a Green Push switches mounted on the door of the starter.
STEP 3. Identify two terminals of starter "OFF Button" usually a Red Push switches mounted on the door of the starter (some times only a push knob will be on the door and switch will be a part of the contactor block inside the panel).
STEP 4. Identify the Power Terminal Block with sticker of connection details in Water Level Controller.
STEP 5. Connect two wires, to "ON BUTTON PARALLEL CON." terminals of 6 way terminal block of Level Controller to the two terminals of ON button (i.e. Connect in parallel) without disturbing existing starter wires as shown in the diagram.
STEP 6. Connect two wires from "OFF BUTTON SERIES CON." of Level Controller to the two terminals of OFF button In series, as shown In the diagram, I.e.
STEP 6a. Remove the wire from any one of the OFF button terminal and join it with one of the "OFF BUTTON SERIES CON." terminal.
STEP 6b. Another "OFF BUTTON SERIES CON." terminal of the Level Controller has to be connected to stop button terminal from where wire was removed In step 6a.
STEP 7. Connect Phase R and Phase B to the power input terminals PHASE-R and PHASE-B.
STEP 8. Put the Auto/Manual Switch of Level Controller to Manual Mode and operate the ON and OFF button to Confirm that the motor in working in Manual Mode.
STEP 9. Now the power connection can be considered completed. Switch OFF the Mains Power and put a layer of insulation tape on top of terminal blocks to avoid any contact of sensing cables with power terminal block.

NOTES:–

1. MOTOR FEEDER WITH DOL STARTER SHALL BE COMPRISING MPCB (WITH IN BUILT O/L RELAY) CONTACTOR WITH BUILT IN SINGLE PHASING PROTECTION FEATURE.
2. LV MOTOR STARTER COMPONENTS RATING SHALL BE AS PER TYPE – 2 CO-ORDINATION OF IEC-60947.
3. CT/PT VA (BURDAN) RATING SHALL BE CONFIRMED BY VENDOR.
4. MOTOR RATING FOR PUMPS CONSIDERED TENTATIVELY AND SHALL BE CONFIRMED AFTER RECEIPT OF VENDOR DATA.
5. WATER LEVEL CONTROLLER WILL HAVE TWO SET OFF SIX TERMINAL, ONE FOR MAIN MOTOR AND OTHER STAND BY MOTOR.

REV.	DATE	DESCRIPTION	DRN BY	CHD BY
2	22.09.18	RE ISSUED FOR TENDER	NSA	PBS
1	31.08.18	RE ISSUED FOR TENDER	NSA	PBS
0	13.07.18	ISSUED FOR REVIEW	MK	PBS

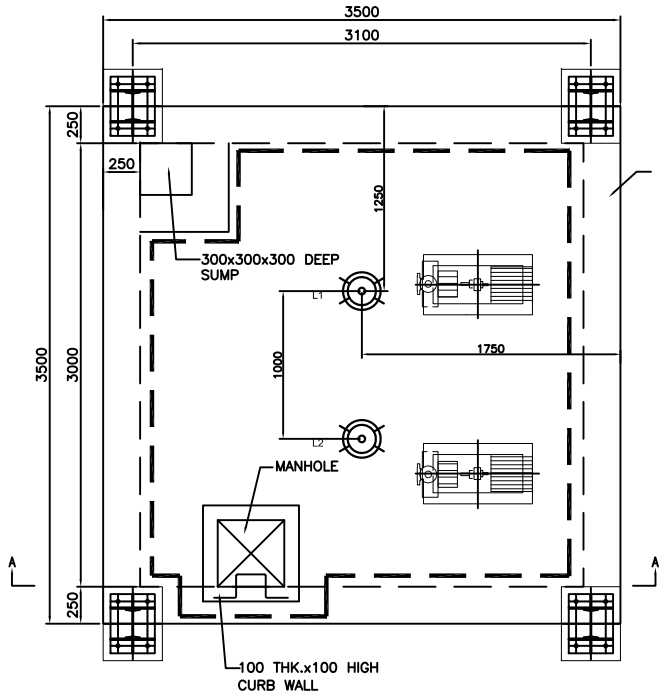
CLIENT : DELHI AVIATION FUEL FACILITY (P) LTD.

PROJECT : MODERNIZATION OF EXISTING FUEL FARM

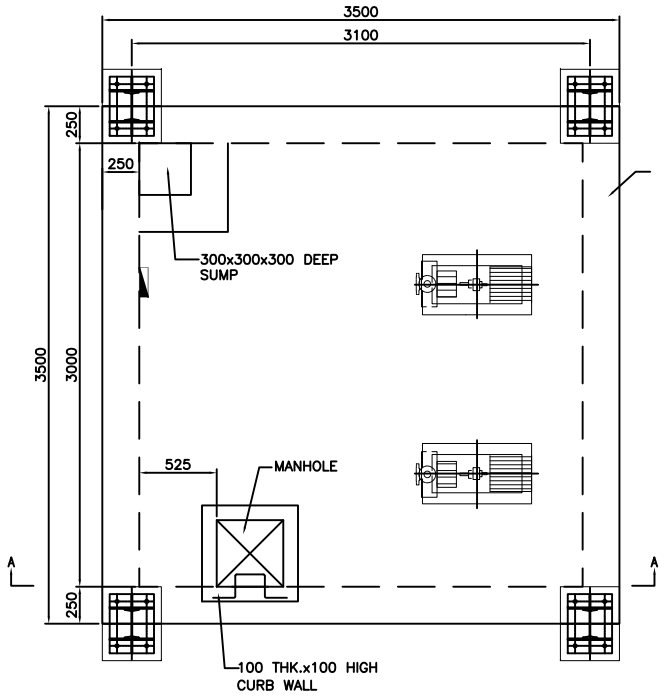
EPCC : SAGA GLOBAL CONSULTANTS

TITLE : SINGLE LINE DIAGRAM FOR COLLECTION PIT

DRAWING No.: DAFFL-DELHI-EL-SD-106 | SHEET: 1/1 | REV. 2 | SCALE : N.T.S

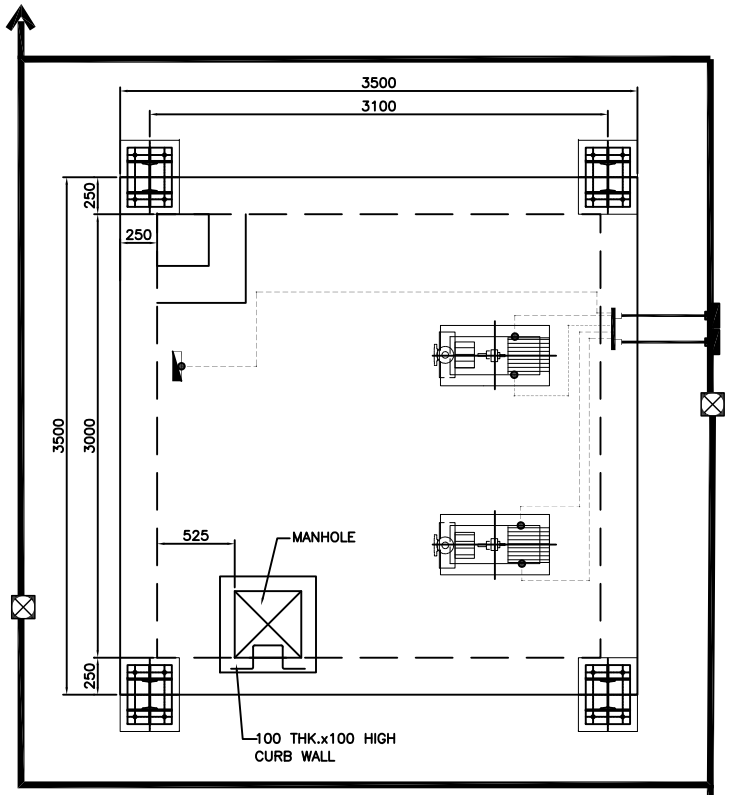


LIGHTING FOR SEPTIC TANK



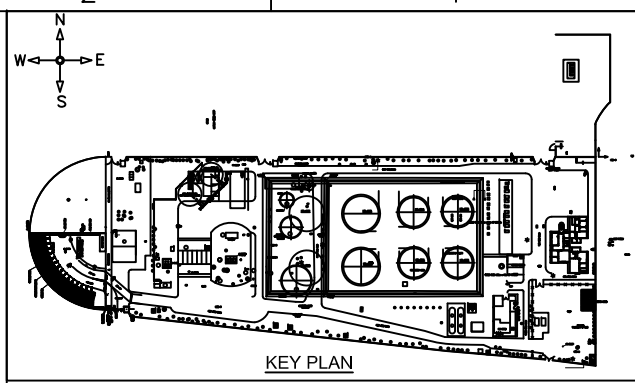
POWER LAYOUT FOR SEPTIC TANK

TO BE CONNECTED TO EXISTING EARTH GRID



TO BE CONNECTED TO EXISTING EARTH GRID

EARTHING LAYOUT FOR SEPTIC TANK



KEY PLAN

LEGEND:-

SR.NO	SYMBOL	DESCRIPTION	QTY
1		36W LED WELL GLASS LIGHTING FIXTURE	2 NO
2		ELECTRICAL EARTH PIT (EEP)	2 NO
3		LT PANEL 2	1 NO
4		100MM PERFORATED TRAY	15 MTR
5		50x6MM GI STRIP	25 MTR
6		NO 8 SWG SOLID GI WIRE	15 MTR
7		CAD WELD BRANCH CONNECTION	2 NOS.
8		EARTHING LUGS	5 NOS.
9	EB	EARTHING BUS BAR	1 NOS.

NOTES:-

1. LOCATION OF LIGHTING FIXTURES AND LV PANEL ARE SUGGESTIVE ONLY. THE EXACT LOCATION SHALL BE DECIDED AT SITE CONSIDERING THE OBSTRUCTION, IF ANY
2. LOCATION OF EARTH BUS & ROUTING OF EARTHING STRIPS/CABLE ARE INDICATIVE ONLY. THE LOCATION/ROUTE SHALL BE DECIDED AT THE SITE CONSIDERING OBSTRUCTION, IF ANY.
3. POWERING OF LV PANEL SHALL BE IN THE SCOPE OF CONTRACTOR.
4. THE CONNECTION OF EARTHING GRID TO EXISTING EARTH GRID SHALL BE IN THE SCOPE OF CONTRACTOR.
5. CONTRACTOR TO MAKE ARRANGEMENT FOR MOUNTING THE LV PANEL.

REV.	DATE	DESCRIPTION	DRN BY	CHD BY
1	31.08.18	RE ISSUED FOR TENDER	NSA	PBS
0	13.07.18	ISSUED FOR REVIEW	MK	PBS

CLIENT : DELHI AVIATION FUEL FACILITY (P) LTD.

PROJECT : MODERNIZATION OF EXISTING FUEL FARM

EPCC : SAGA GLOBAL CONSULTANTS

TITLE : POWER,LIGHTING & EARTHING LAYOUT FOR COLLECTION PIT

DRAWING No.:	SHEET:	REV.	SCALE :
DAFFL-DELHI-EL-LY-106	1/1	1	N.T.S

Project Name:	Basic Design and Detailed Engineering and Other Related Work for the Project, IGI Airport, New Delhi		
Client:	DAFFPL		
Location:	IGI Airport, New Delhi	**Document No.:**	

SEWAGE PUMP DATASHEET

Rev	Date	Description	Prepared	Reviewed	Approved	Client Review
0	31-07-2017	Issued for Approval				

CONTENTS

SEWAGE PUMP DATASHEET

Duty Parameters	
Type of Pump	Screw
Fluid	Raw Sewage
Design Standard	API 676 II ED
Viscosity range	10- 20 Cst
Ph Value	7
Specific Gravity	1.1-1.4
Solids Content	3-5mm
Solid Content	8%
Temperature	0 Deg C- 70 Deg c
Suction Head	Atmospheric
Discharge Pressure	3 Bar g
Differential Pressure	2 Bar g
Seal Type	Mechanical
Seal Design	API BSPFN
O Ring	Viton (R)
Linear	Carbon Steel
Drive	Motor Driven
Motor rating	420V
Safety Valve	Yes
Safety Valve Set pressure	4 Bar g
Type of Duty	Transfer
Location	Indoor / Shed
Protection	IP-55 / weather proof
Pump Operating Parameters	
Flow	10 Cu M / Hr
Motor Rating	3.7 kW
Drive Type	Close Coupled Drive
Pump Suction Size	65 mm (Manufacturer to Confirm)
Pump Discharge Size	50 / 65 mm (Manufacturer to Confirm)
End Connection	Flanges, ANSI B 16.5
Flange	ASTM A 105, ANSI B 16.5, Class 150, Flat face, finish AARH-125
Flange MOC	As per pump vendor
Companion Flange	To match pump mating flange
Companion Flange Specs	ASTM A 105, ANSI B 16.5, Class 150, Flat face, finish AARH-125
Flange Gasket	NON-CAF gasket / Nitrile rubber
Screw	Nitrided carbon Steel

Volumetric Efficiency	As per manufacturer data
Mechanical Efficiency	As per manufacturer data
Pump MOC	As per manufacturer data
Shaft Sealing	Single Acting Unbalanced Bi-Directional, Face Comb. Sic vs Sic

Project Name:	Basic Design and Detailed Engineering and Other Related Work for the Project, IGI Airport, New Delhi		
Client:	DAFFPL		
Location:	IGI Airport, New Delhi	**Document No.:**	

VENDOR LIST SAMPLE

Rev	Date	Description	Prepared	Reviewed	Approved	Client Review
0	05-10-2018	Issued for Approval				

CONTENTS

1.0 LIST OF RECOMMENDED MAKES FOR CIVIL WORKS

SN	MATERIALS	APPROVED MAKES	IS CODE REF.
	ORDINARY PORTLAND CEMENT/ PPC	ULTRA TECH / JP/ JK/ BIRLA / ACC / MADRAS CEMENTS / INDIA CEMENTS/ AMBUJA/ DALMIA / ZUARI/RAMCO/ TOP CEMENT / COROMANDAL	8112 : 1989 12269 : 1987
	STRUCTURAL STEEL - SECTIONS, PLATES, RODS, FLATS, STRIPS ETC.,	TATA / SAIL /RINL / VIZAG / JINDAL/ ESSAR	2062 : 1999
	MS TUBULAR SECTIONS	TATA / SAIL /RINL / VIZAG / JINDAL/ ESSAR	1161 : 1963
	REINFORCEMENT STEEL – MILD STEEL AND MEDIUM TENSILE BARS	TATA / SAIL /RINL / VIZAG / JINDAL/ ESSAR	432 : 1982
	REINFORCEMENT STEEL – HIGH STRENGTH DEFORMED STEEL BARS	TATA / SAIL /RINL / VIZAG / JINDAL/ ESSAR	1786 : 1985
	BURNT CLAY BUILDING BRICKS	ANY APPROVED MAKE	1077 : 1992
	STANDARD CERAMIC TILES (WALLS/FLOOR) / VITRIFIED CERAMIC TILES	KAJARIA / NITCO / REGENCY / SOMANY / JOHNSON / RAK/ HINDWARE	13712 : 1993
	WATERPROOFING COMPOUNDS	FOSROC / ROFF / SIKA / CICCO / ACC/PIDILITE/ DR FIXIT/ IMPERMO	2645 : 2003
	FLOOR HARDENER	IRONITE / HARDONITE/ FOSROC/ PIDILITE/ DR FIXIT/ SIKA/ HARDCRETE	9197 : 1979
	ACRYLIC EMULSION, PAINTS, DISTEMPERS	I.C.I /BERGER /ASIAN /NEROLAC / JENSON & NICHOLSON/ DULUX/ NIPPON/ BRITISH PAINTS	354 : 1989, 428 : 2000
	WATERP ROOF CEMENT PAINTS	SNOWCEM PLUS / DURACEM / SUPREME / SURFACEM/BERGER/ JP/ BRITISH PAINTS/	5410 : 1992
	PRESSED CEMENT CONCRETE TILES	EUROCON / ULTRA / DURACRETE/ SOBHA/ DAZZLE OR EQUIVALENT APPROVED MAKE	13801 : 1993
	PRECAST CEMENT CONCRETE KERBS	EUROCON / ULTRA/ SOBHA OR EQUIVALENT APPROVED MAKE	5758 : 1984
	RCC HUME PIPES	INDIAN HUME PIPE CO LTD OR EQUIVALENT AS APPROVED	458 : 2003
	ROAD MARKING PAINTS	SHALIMAR / MRF/ ASIAN	164 : 1981
	EXPANSION JOINT FOR RCC WORKS	Shalimar, Kampun Polymers, JollyBoard, Softex Industrial Products, Duron Polyvinyls (P) ltd	

2.0 LIST OF RECOMMENDED MAKES FOR MECHANICAL WORKS

GASKET (METALLIC & SOFT IRON, SPIRAL WOUND, NON ASBESTOS, TEFLON)

VENDOR NAME	ADDRESS & CONTACT DETAILS
IGP ENGINEERS LTD.	79, Valmiki Street, Thiruvanmiyur, Chennai, Tamil Nadu 600041. Phone : 044 2442 0608/2442 4804 Fax : 044 2440 5152 E-mail : igp@vsnl.com
MADRAS INDUSTRIAL PRODUCTS	No. 10, Iv Main Road, Green Corner Apartments, Raja AnnamalaiPuram Chennai – 600028, Tamil Nadu, India Mr. J Kumar Mobile : 09176694462 Phone : 044-24610971
CHAMPION SEALS	Champion Compound, 1st Floor, Champion Estate, 15, ParsiPanchayat Road, Andheri (East), Mumbai - 400 069. Maharashtra, INDIA. Phone : +91-22-2836 7311 to 15 Fax : +91-22-2836 7316, 2820 8686 E-mail : purchase@championseals.in, sales@championseals.in& mumbai@championseals.in
LEAK CONTROL	No. 60/ 10, 18th Street Extn., Korattur, Chennai-600 080, Tamil Nadu, India Phone : +91-44-26246704, 65182250 Telefax: +91-44-26246704 E-Mail: leakcontrol@hotmail.com
UNI KLINZER	9, Chitrakoot , 8th Floor, 230A A.J.C.Bose Road Kolkata- 700 020; Phone - 2287 2510;Fax- 033 2287 6494 Contact Person- Mr. BiplabHalder (Zonal Manager) Mobile – 9674165713 , Email- bbhalder@uniklinger.com
JAMES WALKER INMARCO INDUSTRIES PVT. LTD.	104 Gayatri Complex, behind Mittal Industrial Estate AndheriKurla Road, Andheri (East),Mumbai -400 059 Phone - 022 4080 8080; Fax - 022 2859 6220 Email- info@jwinmarco.com
UNIQUE INDUSTRIAL PACKAINGS (P) LTD	27, Bombay Talkies Compound, Malad (W), Mumbai - 400064. India. Phone : 91-22-28803006 / 28884797 Mobile : +91 9321187194 / +91 9320187193 / +91 9820187192 / +91 9320187192

VENDOR NAME	ADDRESS & CONTACT DETAILS
	Fax : 91-22-28821676 E-mail : uip@bom5.vsnl.net.in&uip.9327@gmail.com
SOUTHERN GASKET PRODUCTS	No:57, Balaji Nagar, Padi, Chennai-600050, India. Phone : +91 044 26542413, 26542171 Tele Fax: 044 26546785 / 26540608 Mobile: 98410 22628, 98844 99969 E-mail : sankar@sgp-gaskets.com, sai@sgp-gaskets.com

FASTENERS (ALL TYPES CS/ SS)

VENDOR NAME	ADDRESS & CONTACT DETAILS
EBY INDUSTRIES	2, Hatim Palace, Tank Road, Nagpada, Mumbai - 400008 Phone:022 2741 2346/93234 64278 Mr. Ronak E-mail : ebyfasteners@gmail.com
FAKHRI FASTENERS, CHENNAI	10, PeriannaMaistry Street, PeriannaMaistry Street, Chennai, Tamil Nadu 600001 Phone:098400 59407 Mr.Ali (098400 59407) E-mail : fakhrifasteners@hotmail.com
FASTENER & ALLIED PRODUCTS PVT. LTD.	No.M-3,IndustrialEstate,GokulRoad,Hubli-580030. Phone : +(91)-836-2330062, 2330132, 2330184 Mobile : +(91)-9343411225, 9880527303, +91-836-4252042 Fax : +(91)-836-2300431 E-mail : sales@fappl.com
HARDWIN FASTENERS PVT. LTD.	F-10, Ansa Industrial Estate, Saki Vihar Road, Sakinaka, Andheri (East), Mumbai- 400 072. India. Phone :+ 91 - 22 - 6692 3537, 4005 3537, 2847 0174 Fax : + 91 - 22 - 2847 2739, 2836 5487 E-mail : hardwin@vsnl.com&info@hardwin.in
JJ INDURTRIES	44, Pragati In Estate, N M Joshi Marg, Lower Parel, Lower Parel, Mumbai, Maharashtra 400011. Phone : 022 2309 8600, 0260 240 0454
MULTI FASTENERS PVT. LTD.	986/11, G.I.D.C. ESTATE MAKARPURA. BARODA- 390 010. (GUJ) INDIA. Phone : 0265 - 640874 Tele Fax : 0265 - 640874 E-mail : info@multifastners.net
PRESIDENT ENGINEERING LTD.	110, Neelkanth Commercial Center, 122/123, Sahar Road, Andheri (East),Mumbai - 400 099

VENDOR NAME	ADDRESS & CONTACT DETAILS
	Maharashtra, India Phone : + 91 22 2839 8409 / + 91 22 2839 8410 Fax: + 91 22 2839 8318 E-mail: marketing@presidentengg.com
SYNDICATE ENGINEERING INDUSTRIES	Plot No.A-257, TTC Industrial Area, M.I.D.C. MahapeVillage,ThaneBelapur Road, Navi-Mumbai:400701. Phone : +91-22-27781191 / +91- 22-25004945 E-mail: info@syndicateengg.com
PRECISION AUTO ENGINEERS	934, Nirankari Street - 7, Opp. S.B.I., Miller Ganj, Ludhiana - 141003, Punjab (INDIA). Mr. Anil Kumar Gupta/Raj Kumar Gupta Mobile : + 91 - 98729 - 76003, 94174 – 49545 Phone : + 91 - 161 - 2532448, 2542171, 2540377 Fax : + 91 - 161 – 2540337 E-mail : studfastener@gmail.com, info@paesteel.com, studfastener@comeconnect.com
PACIFIC FORGING & FASTENERS	19, “Nakshatra” V. Mehta Road, JVPD Scheme, Mumbai-400 056. Phone : No 91-22-26186070(6lines) Fax : 022 26186077/78. Email : sales@pacific-fasteners.com
PERFECTT SERVICES, CHENNAI	28/2, Jones Street, Chennai - 600 001 Tamil Nadu, India Phone : +(91)-44-42620678, 42165052 Mobile : +(91)-9840778001, 7418141415 Fax : +(91)-44-25232500 E-mail : perfectservicesmadras@gmail.com
UNBRAKO	Deepak Fasteners Limited , 4th Floor , First Mall , Mall Road , Ludhiana -141001,Punjab , India Ph. No.: +91-161-3911111 E- Mail: unbrakosales@unbrako.com

VALVE GATE CAST/ FORGED CS & SS

VENDOR NAME	ADDRESS & CONTACT DETAILS
LARSEN & TOUBRO LTD.	1 ,Powai Campus Saki Vihar Road, Saki Vihar, Mumbai, Maharashtra (Central) - 400072 Mr M S Rajaraman (Sales manager) Mobile : 96199 72089 Phone : 022 67053690 Fax : 022 67051727 E-mail : rajaramanms@lntvalves.com
LEADERS VALVES LTD.	24C/106, MhadaComplex.Bimbisar Nagar, W.E. Highway, Goregaon- East, Mumbai-400065 Ph. No. 022- 26859345, Fax – 022-26859346 E- Mail: - rmmumbai@leadervalves.com Kind Attn: - Mr. Rajeev Gupta(Regional Manager)
NECO SCHUBERT & SALZER (NSSL)	422 & 301, Tulsiani Chambers, Nariman Point, MUMBAI - 400 021 Telephone - 022 - 22823015, 22832381, 22820967, 22823244 Telefax -022 - 22832367 E-mail - necobby@bom3.vsnl.net.in
KSB PUMPS LTD (VALVE DIVISION)	No 151, Mettupalayam Road, Narasimhanaickenpalyam, Coimbatore - 641031, NsnPalayam Post Phone : +(91)-422-2468222, 2468302, 2468340, 2468145, 2468173 Mobile : +(91)-9362230661 Fax : +(91)-422-2468232
WEIR BDK ENGINEERING INDUSTRIES LTD.	305 Trade Center, BandraKurla Complex, Bandra (East), Mumbai - 400 050 Phone : +91-022-4215 6370 to 74 Fax : +91-022-4215 6375 E-mail : bdk.mumbai@weirgroup.com
NITON VALVE INDUSTRIES LTD.	D-115 Ghatkopar Ind. Estate, L.B.S. Marg, Ghatkopar (W) Mumbai-400086 Phone : +91 22 67539800 / 6796 9786 Fax : +91 22 67969790 / 6753 9874 E-mail :nitonvalve@vsnl.com
OSWAL INDUSTRIES	3rd floor.,Kartar Mansion, Tribhuvan Rd., Off. Lamington Rd., Mumbai-400004. India. Tel:(+91)22-61448000-99 Tel/Fax: (+91)22-23861642

VENDOR NAME	ADDRESS & CONTACT DETAILS
	E-mail: mktg@oswalvalves.com
STEEL STRONG VALVES INDIA PVT. LTD.	Plot NO. R-241, TTC Industrial Area, MIDC, Rabale - 400701, Maharashtra, India. Mr. Krishna B Bagade. Telephone: (022) 27690074/5336/27607005 Mobile: 9223252281 Fax No: (91-22) 27695537 E-mail : mkt1@steelstrong.com
S&M INDUSTRIAL VALVES LTD	1, A.J.C. Bose Road, 3rd Floor, Kolkata – 700 020 Phone:- 2282 3172/ 2946; Email-sales@steammining.com Contact Person-Mr.Sourav Bose, Cell -98311 54387 MrG.Sarkar, Cell - 98301 54757
FOURESS GROUP	C-2, MIDC Industrial Area, Paithan, Aurangabad - 431 148. Mr. Sameer Kulkarni Phone: 02431 - 232074 / 232376 Fax : 02431 - 232058 Email : ssk@fouressindia.com
SAKHI ENGINEERS PVT. LTD.	22 Swastik Chambers, SionTrombay Road, Chembur, Mumbai-400071, India. Fax No.: 0091-22- 2522 7858 Tel. No.: 0091-22-25220262/64
SHIVA DURGA IRON WORKS(P) LTD	156 / 1, Madhusudan Pal Chowdhury Lane Kadamtala Howrah - 711 101 West Bengal, India Phone : 091 33 2643 8217, 2643 8364, 2643 9386 Fax : 091 - 33-2643 8730 E-mail : shivadurga@vsnl.net
NUTECH CONTROLS	640/6/6, Narottam Building, Kapasia Bazar, Kalupur, Ahmedabad -380 002. Gujarat Phone : +91 79 22133122/238 Fax : +91 79 22133122 E-mail : sales@nutechvalves.com
AKSONS MECHANICAL ENTERPRISES	Plot No. A-72, Road No.22 Wagle Industrial Estate, Waagle Estate, Thane-400604. Mobile : +91 9821233682 Phone : +91-22 25813997/ 25826857 /29200020 Fax : +91-22 28210491 E-mail : vkshetty@bom3.vsnl.net.in,

VENDOR NAME	ADDRESS & CONTACT DETAILS
	vkshetty@mtnl.net.in, aksons@hotmail.com, vkshetty47@gmail.com
FLOWCHEM VALVES, AHMEDABAD	Flowchem House, Near Sukan Mall, Science City Road, Sola, Ahmedabad - 380 060. Gujarat - India Mobile : +91-9825013437, +91-09727742104 Phone : + 91-79-2771 2102 / 2771 2103 Fax : + 91-79-2771 2101 E-mail : flowchem@flowchem.com
BHEL (VALVE DIVISION)	IPM & OFE,INDUSTRY SECTOR INTEGRATED OFFICE COMPLEX LODHI ROAD NEW DELHI 110003 INDIA PH:4367680/8409/8350/6807 FX:4365180/7749 E-mail:pcb@bhelindustry.com/ rmahajan@bhelindustry.com
SANMAR ENGG – XOMOX VALVES	9, Cathedral Road, Chennai - 600 086, Tamil Nadu, India. Tel. : + 91 44 2812 8500 Fax. : + 91 44 2811 1902 Email : reachus@sanmargroup.com
HINA INDUSTRIES	9, Meldi Estate, NR. Gota Over Bridge, Gota, Ahmedabad -382 481. Gujarat, India Mobile: +91-9825078717/ 9426172362 Telephone: +91-79-6525 0528 / 29 Fax: +91-2717-241746 Email: hinaind.valve@gmail.com

VALVE NON-RETURN/CHECK/GLOBE/BALL CAST CS & SS

VENDOR NAME	ADDRESS & CONTACT DETAILS
LARSEN & TOUBRO LTD.	Same as above
LEADERS VALVES LTD.	Same as above
NECO SCHUBERT & SALZER	Same as above
KSB PUMPS LTD (VALVE DIVISION)	Same as above
WEIR BDK ENGINEERING INDUSTRIES LTD.	Same as above
NITON VALVE INDUSTRIES LTD.	Same as above
OSWAL INDUSTRIES	Same as above
STEEL STRONG VALVES INDIA PVT. LTD.	Same as above
S&M INDUSTRIAL VALVES LTD	1, A. J. C. Bose Road, 3rd. floor. Kolkata- 700020 Tel: 2282 3172 / 2946. Fax: 91-33-2282 8266. Email : sales@steammining.com/info@steammining.com
SAKHI ENGINEERS PVT. LTD.	Same as above
SHIVA DURGA IRON WORKS(P) LTD.	Same as above
NUTECH CONTROLS	Same as above
FOURESS GROUP	Same as above
AKSONS MECHANICAL ENTERPRISES,	Same as above
HI TECH VALVES, CHENNAI	Same as above
FLOWCHEM VALVES, AHMEDABAD	Same as above
SANMAR ENGG – XOMOX VALVES	Same as above
HINA INDUSTRIES	Same as above

VALVE BUTTERFLY (CARBON STEEL)

VENDOR NAME	ADDRESS & CONTACT DETAILS
ADVANCE VALVES PVT. LTD.	142 A & B, Noida Special Economic Zone, NOIDA, Phase II - 201 305 (India) Tel: +91 120 479 6900 Fax: +91 120 479 6948
LEADERS VALVES LTD.	Same as above
INTERVALVE (INDIA) LTD.	212/2, Hadapsar, Off Soli Poonawalla Road, Pune 411 028 Tel: 91-20-2699 3900, 2699 3904

VENDOR NAME	ADDRESS & CONTACT DETAILS
	Fax: 91-20-2699 3921 E-Mail : intervalve@poonawallagroup.com Contact Persons : For Butterfly Valves : Mr. Ravi Swami Nathan For GGC & Ball Valves : Mr. JyotiAnand
CRANE PROCESS CONTROLS PVT. LTD.	Plot No E/7 E 8/2, Bus Stop Road, MIDC Satara, Satara - 415004, Old MIDC Phone : +(91)-2162-245623, 244417 Fax : +(91)-2162-245126
WEIR BDK ENGINEERING INDUSTRIES LTD.	Same as above
LARSEN & TOUBRO LTD.	Same as above
TYCO VALVES & CONTROLS INDIA PVT. LTD.	Plot No R 701, TTC Industrial Area, MIDC, Rabale, Navi Mumbai – 400701 Phone : 022 - 66903200, 27607002, 27607003 E-mail : tvcindia@tyco-valves.com
INSTRUMENTATION LTD. (PALGHAT)	Kanjikode West, Palakkad, Kerala - 678 623. Tel : 91-491- 2566127/128/129/130, 2567128/129, 2566133 Fax : 91-491- 2566135, 2566240 E-mail: contact@ilpgt.com
SHIVA DURGA IRON WORKS(P) LTD -	Same as above
NUTECH CONTROLS	Same as above
FOURESS GROUP	Same as above
FLOWCHEM VALVES, AHMEDABAD	Same as above
FLUIDINE VALVES CO. PVT. LTD.	401 - A, Poonam Chambers, 115, Dr. Annie Besant Road, Worli, Mumbai 400 018 India Phone: +91 22 2494 4057 / 2494 Fax: +91 22 2494 4059 E-mail: fluidline@hathway.com

FITTINGS INCLUDING HALF COUPLING AND NIPPLE

VENDOR NAME	ADDRESS & CONTACT DETAILS
COMMERCIAL SUPPLY AGENCY	211, Nagdevi St. Jamal Bldg., 2nd Flr., Mumbai, Maharashtra - 400003, Phone - 022-3400072; Fax -022-3429868
EBY INDUSTRIES	Address :-PLOT NO.C-19/4, MIDC INDL AREA TALOJA, NEAR DENA BANK, Taloja - 410208, Maharashtra Contact Person-Mr. R. Mamawalla (+91 9323464278)
EBY FASTNERS	11 C-19/4, MIDC INDL. AREA TALOJA DIST RAIGAD INDIA PH:22-7412346, 7412320 FX:022-7412320 E-mail:ebfrem@vsnl.com
M S FITTINGS	Address :- 17, Weston St. Kolkata-700013, India Phone:- 033-2236-2869, 2236-2902/3 Fax:- 033-2225-2103 Email:- headoffice@msfittings.com
TEEKAY TUBES	Address:Plot No C-102, TTC Industrial Area,Village - Pawane Off – Thane BelapurRoad,Navi Mumbai- 400 705 Phone – 022 4141 7777/ 6633 1010; Fax- 022 4141 7700 Email- sales@teekay.co.in
TUBE PRODUCTS INCORPORATE	PLOT NO.748/7, G.I.D.C. ESTATE, MAKARPURA, Vadodara - 391243, Gujarat, India Contact Person:-Mr. JanakKatakia , Phone No- 0265-6545211/12/13/3049640/3049644 Fax No - 0265-2831031
M/s LEADER VALVES LIMITED (upto 300# &upto 12"size)	S-3,S-4, INDUSTRIAL TOWN, JALANDHAR 144004 INDIA PH:0181-2490666,777,888, 9216 703292 /939406 ,011-23264037, FX:0181-2290894,2294256, 011-23264037 E-mail: info@leadervalves.com; rmdelhi@leadervalves.com; vineetsikka@leadervalves.com
GAYATRI FORGE PVT. LTD.	ADDRESS: 59, MOHAMMED ALI ROAD, 2ND FLOOR, P O BOX 3480, MOHAMMED ALI ROAD, MUMBAI, MAHARASHTRA 400003 PHONE: 022 2344 3495

VENDOR NAME	ADDRESS & CONTACT DETAILS
SUPER FORGE PVT. LTD.	ADDRESS: 3C/16 GROUND FLOOR, MUM TAXIMEN'S SOCIETY, LAL BAHADUR SHASTRI MARG, KURLA, KURLA, MUMBAI, MAHARASHTRA 400070 PHONE: 022 2650 2623
TUBE BENDS (CALCUTTA) PVT. LTD. (CS FITTINGS ONLY)	15, ELGIN ROAD, 1st FlOOR KOLKATA 700020 INDIA PH:033-22815618, 22877665,9836217361 FX:033- 22877665 E-mail: tube_bend@dataone.in

PIPE CARBON STEEL (INDIAN STANDARD)

VENDOR NAME	ADDRESS & CONTACT DETAILS
STEEL AUTHORITY OF INDIA	ISPAT BHAWAN LODHI ROAD NEW DELHI 110003 INDIA
ADVANCE STEEL TUBE LTD.	81, F.I.E. Patparganj, Delhi-110092 Phone : 011- 43041400 Fax : 011-22145978 E-Mail : info@tirupatipipes.com, info@advance.co.in
ASIAN MILLS PVT. LTD.	104, Sakar-III, Near Income Tax Circle, Ahmedabad-380014, Gujarat, India Tel :+91-079-27582515/16/17 Fax :+91-079-27546320 Email : info@asiansteels.com
JINDAL PIPES LTD.	402, Sarjan Plaza, 100, Dr. Annie Besant Road, Opp Telco Showroom, Worli, Mumbai - 400 018 (India) Tel. : +91 22 24902570 / 72 / 74 Fax : +91 22 24925473 Email : mslmum@mtnl.net.in
MAHARASHTRA SEAMLESS LTD.	402 Sarjan Plaza, Dr Annie Besant Road, Worli, Mumbai - 400018, Opposite Telco Showroom Phone : +(91)-22- 24902570, 24902572, 24902574, 24902576 Fax : +(91)-22-24925473

VENDOR NAME	ADDRESS & CONTACT DETAILS
MAN INDUSTRIES (I) LTD.	Man House, 101, S.V. Road, Vile Parle (W), Mumbai - 400 056. INDIA. Tel : +91-22-6647 7500 Fax : +91-22-6647 7600 Email : enquiry@maninds.org, Web site: www.mangroup.com
NORTH EASTERN TUBES LTD.	D. D. Tower, 5th Floor, Christian Basti G. S. Road, Guwahati - 781 005 Assam, INDIA Phone : 91-361-234 3951 / 234 3952 Fax : 91-361-234 3953 E-mail : netl@nezonesteel.com Contact Person Mr. S.M. Agarwal - Director, Ph : 91-361-234 3946, Mobile : 98640 28740 E-mail : smagarwal@nezonesteel.com
RATNAMANI METALS & TUBES LTD.	Address : PanchsheelPlaza,'B' Wing, 2nd Floor, 55, GamdeviRoad,NearDharam Palace, Mumbai – 400007 Telephone : +91-22-43334555 Fax : +91-22-43334575 E-mail : info.mumbai@ratnamani.com
STEEL TUBES INDIA	Same as above
SURYA ROSHNI LTD.	Hollow Section & Cr Strip), Prakash Nagar, Delhi-Rohtak Road, Bhadurgarh -124507 (Haryana) India Phone: +91 1276 241540, 241980/81/82 Fax : +91 01276 241886 E-mail: surya@sroshni.com
SWASTIK PIPES LTD.	1/23 B Asaf Ali Road, New Delhi - 110002 Phone : + 91-11-47471717 Fax : + 91-11- 47471718 E-mail : info@swastikpipes.com
TATA IRON STEEL LTD.	Bombay House, 24, HomiMody Street, Mumbai - 400 001 Ph: 91 022 66658282
WELSPUN GUJRAT STAHL ROHREN LTD.	Address :Welspun City, Tal. Anjar, District Kutch, Gujarat 370 110, INDIA Tel: +91 2836 662222 Fax : +91 2836 279060

VENDOR NAME	ADDRESS & CONTACT DETAILS
	Email: sales_wcl@welspun.com
ESSAR INDIA LIMITED	Essar House, 11, KeshavraoKhadyeMarg, Mahalaxmi Mumbai 400 034, Maharashtra, India Telephone: +91-22- 66601100 Fax: +91-22-66601809

PIPES & TUBES (API STANDARDS)

VENDOR NAME	ADDRESS & CONTACT DETAILS
STEEL AUTHORITY OF INDIA	ISPAT BHAWAN LODHI ROAD NEW DELHI 110003 INDIA
JINDAL PIPES LTD.	Same as above
LALIT PROFILES & STEEL INDUSTRIES LTD.	Same as above
LLYODS METALS & ENGINEERS LTD.	Trade World, 'C' Wing, 16th Floor, Kamala City, Lower Parel, Mumbai - 400 013. PHONE: +91-22-30418111/06 FAX: 91-22-30418260/59 E Mail: vvshettigar@lloyds.in, svnagraj@lloyds.in hsmishra@lloyds.in
MAHARASHTRA SEAMLESS LTD.	Same as above
MAN INDUSTRIES (I) LTD.	Same as above
SAW PIPES LIMITED	
THE TATA IRON & STEEL CO.LTD.	Address: 87, New India Assurance Building, M G Road, Fort, Gpo, Mumbai, 400001 Phone: 098206 55840
NORTH EASTERN TUBES LTD.	Same as above
RATNAMANI METALS & TUBES LTD.	Same as above
STEEL TUBES INDIA	Same as above
SURYA ROSHNI LTD.	Same as above
WELSPUN GUJRAT STAHL ROHREN LTD.	Same as above
JOTINDRA STEEL & TUBES	Address :14/3, Mathura Road, Near MewlaMaharajpur Village, Sector 45, Faridabad-121003 (Haryana)

VENDOR NAME	ADDRESS & CONTACT DETAILS
	Phone : +91-129-2477888, 2272416, 2252356 Telefax : +91-129-2477898 E-mail : jotindra@jotindra.com
ASIAN MILLS	Same as above
ESSAR INDIA LTD	Same as above

PIPE CARBON STEEL (SEAMLESS TO ASTM STANDARD)

VENDOR NAME	ADDRESS & CONTACT DETAILS
HEAVY METALS & TUBES LIMITED (MEHSANA)	12, SKM House , 6th Khetwadi, Mumbai - 400 004. + 91- 22 - 2386 1761/ 2380 2232 hitesh@heavytubes.com hmtbby@heavytubes.com
MAHALAXMI SEAMLESS LTD.	54-A Virwani Industrial Estate, Western Express Highway Goregoan (E), Mumbai 400 063 Tel: +91-22-65013491/92 Fax: +91 22 67048987 e-mail- enquiry@mahatubes.co
MAHARASHTRA SEAMLESS LTD.	Same as above
PSL LTD	Address :PSL Tower, Makwana Rd, Gamdevi, Marol Naka, Andheri East, Mumbai 400059 Phone:022 6644 7777, 6644 7788 Fax : 022 6644 7700, 6644 7711 E-mail : psl@pslltd.co.in
STEEL TUBES INDIA	Same as above
JINDAL	Same as above
INDIAN SEAMLESS METAL TUBES LTD	ISMT Limited Lunkad Tower, Viman Nagar, Pune – 14 Tel: +91 20 414 341 00/01 +91 20 660 249 01/02/03/04 Fax: +91 20 266 307 79 E-mail : enquiry@ismt.co.in

PIPE SS & TUBES (SEAMLESS & WELDED TO ASTM STANDARD)

VENDOR NAME	ADDRESS & CONTACT DETAILS
HEAVY METALS & TUBES LIMITED (MEHSANA)	Same as above
REMI ENGINEERING WORKS	Remi House, 11, Cama Industrial Estate, Walbhat Road, Goregaon East, Mumbai – 400063. India Tel. : +91 - 22 - 4058 9888 / 800 Fax : +91 - 22 - 2685 3868 E-mail: remiprocess@remigroup.com
RATNAMANI METALS & TUBES LTD.	Same as above
SANDVIK ASIA LTD.	Sandvik India Pvt Ltd Mumbai Pune Road, Dapodi, Pune - 411 012 PHONE : +91 20 27104800 FAX : +91 20 27145339
SAW PIPES LTD. NASIK	A-59/60, M I D C, Malegaon Sinnar, Malegaon Sinnar, Nashik, Maharashtra 422103 Phone:0253 223 0239
CHOKSI TUBE COMPANY CO. LTD.	Office no-801, 8th Floor, samruddhi building, old gujarat High Court, Opposite Sakar-3, Navrangpura, Ahmedabad - 380014, Gujarat, Mr. JayeshChoksi (Senior Manager Finance) Mobile : +919327584494 Phone : 91-79-30082532/30082533
PRAKASH STEELAGE LTD.	Same as above
SURAJ STAINLESS LTD.	'Suraj House' Opp. Usmanpura Garden, Ashram Road, Ahmedabad. Pin – 380 014, Gujarat Tel : +91-79-27540720, 27540721 Fax : +91-79-27540722 E-mail : domestic@surajgroup.com, purchase@surajgroup.com

EXPANSION BELLOW (RUBBER/CANVAS)

VENDOR NAME	ADDRESS & CONTACT DETAILS
KEILD ELENTOFF	4th FlrChurchgateHse 32-34 V N Rd Fort-1 Mumbai-400001 T: +91 96191 81907 E: kebom@keldindia.com
ATHULYA BELLOWS & ENGINEERING PVT. LTD.	B-3, Sahajanand Appt., Near Ward Office No. 6, Old Padra Road, Vadodara-20.(Gujarat), India.

VENDOR NAME	ADDRESS & CONTACT DETAILS
	Phone : (91) 0265 2344238, 5544238 Fax : (91) 0265 2352805 E-mail : response@athulyabellow.com, athulyabello@satyam.net.in
ALFA FLEXITUBES PVT. LTD.	SaurabhTondon (Director-Intl. Business) 1726 & 1743, Modern Industrial Estate Bahadurgarh - 124507, Haryana, India Call Us: 08588831099 Mobile: +(91)-9873965080, +(91)-9811209178 Telephone: +(91)-(1276)-268119, +(91)-(1276)-267175 Fax: +(91)-(11)-25261475, +(91)-(1276)-267134
AREA FLEXIBLE INDUSTRIES	No. 1-B, Kailash Nagar, Near Sadiq- Ki- PuliaPratapViharSantosh Medical Hospital Ghaziabad, Ghaziabad – 201001, Uttar Pradesh, India M. K. Ansari Call Us: 08042907673
FLEXICAN BELLOWS & HOSES PVT LTD	283, G I D C, Makarpura, Makarpura, Vadodara, Gujarat 390010 Phone:0265 263 4614 HimanshuMistry Mob: 09377114220, 0265-3043200

SEPARATOR (STRAINER & FILTER)

VENDOR NAME	ADDRESS & CONTACT DETAILS
MULTITEX FILTRATION ENGINEERS LTD.	217, Hans Bhavan, Bahadur Shah ZafarMarg, Bahadur Shah ZafarMarg, New Delhi, Delhi 110002 Phone:011 2331 1275, 42404040 Mobile : 09811795254
M/s LEADER VALVES LIMITED (upto 300# &upto 12"size)	S-3,S-4, INDUSTRIAL TOWN, JALANDHAR 144004 INDIA PH:0181-2490666,777,888, 9216 703292 /939406 ,011-23264037, FX:0181-2290894,2294256, 011-23264037 E-mail: info@leadervalves.com; rmdelhi@leadervalves.com; vineetsikka@leadervalves.com
PETROMAR ENGINEERED SOLUTION PVT. LTD.	204-206 Dheeraj Heritage, S. V. Road, Santacruz (W), Mumbai 400 054. India Tel.: +91 (22) 2660 1933 Fax: +91 (22) 2660 1976 Email: sales@petromar.in
FIL SEP EQUIPMENTS PVT. LTD.	E - 506, Kalpavrux Complex, Gotri Road, Vadodara – 21, Gujarat

VENDOR NAME	ADDRESS & CONTACT DETAILS
	Phone:0265 304 3756 E-mail : sales@filsep.com
PALL INDIA PVT. LTD.	UMER PLAZA,6th floor, CTS 419, Village Marol, MarolMaroshi Road, Andheri(East), Mumbai 400 059. India Phone : +91 - 22 - 6799 55 55 Fax : +91 - 22 - 6799 55 5
BHATIA ENGINEERING COMPANY	6, DSIDC COMPLEX, JHILMIL INDL. AREA, Delhi - 110095, India Key Personnel: Mr. Gagan Bhatia (Director) Mobile :+919717866220 Phone :91-11-22583488 Fax :91-11-22583277 E-mail : bsbhatia@del3.vsnl.net.in
SUNGOV ENGINEERING PVT LTD	160, Baba Nagar, Villivakkam, Chennai , India - 600 049 (p) +91-44-26501404, 26501536 (f) +91-44- 26501408
S & M INDUSTRIAL VALVES LTD.	Same as above
JAY-EESH ENGINEERING	No. 17/20, Acharya Industrial Estate, Tejpal Compound AndheriKurla Road, Sakinaka, Andheri East Mumbai - 400072 Maharashtra, India Contact Peroson : Mr. A Hamid Mobile : 09819914473 Phone : 022-2850216 E-mail : jayeesh_engg@rediffmail.com
ALECON COMMERCIAL PVT. LTD.	No. 106, Raja Dinendra Street Kolkata - 700064 West Bengal, India Mobile : 09433093927 Phone : 033-25540442 E-mail : alecon.filters@vsnl.net
PROCEDYNE ENGINEERS	No.4, Jayaram Avenue, ShastriNagar,Adyar, Chennai - 600 020, Tamil Nadu, India. +91-44-42024696 / 42125777 / 43511056 sales@industrialstrainers.com +91-44-42125777
FLUIDYNE INSTRUMENTS PVT LTD	No. 3, 1st Floor, Uday Building, 70-D, Central Avenue Road, Next To Hotel Grand Central, Near Chembur Station, Chembur East, Mumbai (India) - 400071 Mobile : +(91) – 9821027547, 9819626265 Phone : +(91) - (22) – 25285345, 25280073 Call Us : 08447519830
GRAND PRIX(P) LTD.	Plot No.82, Sector 25, Faridabad – 121004

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	Haryana (INDIA) Tel : +91-129-4097700, 4151820-28 Fax : +91-129-4151821 E-mail : sales@grandprixfilters.com, mail@grandprixfilters.com
FILTERATION ENGINEERS INDIA PVT. LTD.	Plot W 62B, TTC Industrial Area, MIDC Rabale, Navi Mumbai 400701 India. Phone: +91 22 27608501 / 27693111 Mobile: +91-8879299053 Email: sales@feipl.com | anshika@feipl.com
RAK DIN ENGINEERS	Renu Sharma (Managing Partner) B- 5, AcharyaNiketan, MayurVihar, Phase- 1 New Delhi - 110091, Delhi, India Call Us: 08048077771 Mobile: +(91)-9811108868, 9899598868 E-mail : rakdinengineers@gmail.com
SUPERFLO FILTERS	B-5, 103/104, GREENLAND CO.OP. SOCIETY, SRINIVAS BAGARKA ROAD, J. B. NAGAR, ANDHERI (EAST), MUMBAI - 400 059, INDIA. Phone : +91 22 28252540 / 28252560 Fax : +91 22 28265811 E-mail : superflo@superflo-filters.com, superflo@bom3.vsnl.net.in

PRESSURE GAUGES/ TEMPERATURE GAUGE

VENDOR NAME	ADDRESS & CONTACT DETAILS
A. N. INSTRUMENTS PVT. LTD.	3/907, Navjiban Society, Lamington Road, Mumbai – 400 008. Phone No. :+91 022 2308 7395 Tele Fax. : +91 022 2300 2172 Fax No. : +91 022 2307 2867 E-mail : animum04@yahoo.com
WAREE INSTRUMENTS	602, Western Edge- I, Off. Western Express Highway, Borivali (East), Mumbai - 400066 Phone: 022 - 66444444 Email: waaree@waaree.com
ASHCROFT INDIA PVT. LIMITED	Plot 2306, GIDC Chhatral, Ta. Kalol, DIst.Gandhinagar, Chhatral - 382729, Gujarat. Phone: +91 2764 233681/82/83 Fax: +91 2464 233440 E-mail: sales@ashcroftindia.com

VENDOR NAME	ADDRESS & CONTACT DETAILS
GE GAUGES PVT LTD	249 B, DUM Dum Road, Kolkata - 700074, Near Bagjola Phone : +(91)-33-25486940 Mobile : +(91)-9231520123
H.GURU INDUSTRIES	603, Crystal Paradise besides, Janki Center, Jeevan Nagar, Opp. Veera Desai Road, Andheri West, Mumbai-400 053 E-mail :contact@hguruindustries.com PH : 022- 40106014/40106015 , PH : 022-40106014 (Mr. PK Mitra) PH : 09820016422 , FAX : 022- 40106013
GLUCK (INDIA) LTD	B/114 Shivshakti Industrial Estate L B S MargGhatkopar West, Mumbai - 400086, Maharashtra, India Contact Person : Mr Y N Padia (Director) Mobile / Cell Phone No. : 22 - 25000679
BAUMER TECHNOLOGIES	Baumer India Private Limited Fourhum Centre, S.No. 112/2/21, 112/2/64 & 112/2/72, Opp. RMD Sinhgad Institute, Pune-Mumbai Highway, Warje 411058 Pune, India Phone +91 2066292400 Fax +91 2025286835
GENERAL INSTRUMENTS CONSORTIUM	194/195, Gopi Tank Road, Behind Citylight Cinema, Mahim, Mumbai - 400016, Maharashtra, India Tel : 0091-22-24454387 0091-22-24449177 Fax : 0091-22-24449123 0091-22-24463507 Email : info@general-gauges.com exports@general-gauges.com
WIKA INSTRUMENTS INDIA PVT. LTD.	A 703 Pranik Chambers ,Saki Naka Junction, Saki Vihar Road , Mumbai 400072, India Mr. Sunil Janwadkar Tel.:+91 22 28575915 / 6 E-mail : wikabom@wika.co.in
MANOMETER INDIA	31, YogeshBhavan, Manu Mansion, S B S Road, N S PatkarMarg, Grant Road, Mumbai - 400007, 400007 Phone:022 2266 2076

THERMAL RELIEF VALVE

VENDOR NAME	ADDRESS & CONTACT DETAILS
DARLING MUESCO	Darling Muesco India Pvt. Ltd. Plot No. 97, Phase – 1, G.I.D.C. Estate, Vatva, Ahmedabad - 382445. Phone: +91 79 4008 4881 to 4884, Fax: +91 79 2583 2578 E-mail: sales@darlingmuesco.com
NIRMAL INDUSTRIAL CONTROLS	First Floor, Samriddhi, L.B.S. Road, Mulund(W), Mumbai - 400 080 Ph.: +91-22-67746200, 91-22-25608668 Fax : +91-22-25682771 Email: info@nirmalindustries.com Website: www.nirmalindustries.com
ASIAN INDUSTRIAL VALVES AND INSTRUMENTS	No-b-16, Industrial Area, Mogappair East, Mogappair East, Chennai 600050 Phone:044 2653 1137
TYCO SANMAR LTD.	Same as above
TELEFLO INSTRUMENT CO. PVT. LTD.	No. 3, Uday Building, 70-D/3 Central Avenue, Next to 'Hotel Grand Central', CHEMBUR (East) Mumbai -400071. Contact Person : Mr. K Sampath Phone : +(91)-(22)-25285345 / 25280073 Mobile No : +(91)-9821027547 Fax : + (91)-(22)-25280642 E-mail : mail@telefloindia.com, teleflo@yahoo.com, teleflo@hotmail.com, fluidyne@yahoo.com, fluidyne@hotmail.com
MEKASTER ENGINEERING LTD.	2507, G.I.D.C. Estate, Halol-389350, Dist. Panchmahal, Gujarat (India). Phone: (02676) 220986/220706. Fax: (02676) 220981 Email: mel@mekaster.com

ORIFICE PLATE & ASSEMBLY

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VENDOR NAME	ADDRESS & CONTACT DETAILS
BALIGA LIGHTING	Same as above
ENGINEERING SPECIALTIES	30-F Free School Street, Kolkata – 700 016 Phone No. : (033) 2252 5584, 2252 2064 Fax No. +91-33-2252 4718 E'mailesplcal@vsnl.com, contact@espl.co.in
MICRO PRECISION	238, Pantarapalya, Mysore Road Bangalore 560 039. Ph: +91 080 2675 0385 Fax: +91 080 2674 3238 Enquiry: info@micro-precision.in Sales: sales@micro-precision.in
EUREKA INDUSTRIAL	17 - 20, 1st Floor, Royal Chambers, Paud Road, Pune 411 038, Maharashtra. Tel : 0091-20-25443079 Fax: 0091-20-25441323 Email: sales@eurekaflow.com
UNI-CONTROLS INSTRUMENTS	22/S, Sreenath Mukherjee Lane, Sreenath Mukherjee Lane, Kolkata, West Bengal 700030 Phone:033 2556 4891
CHEMTROLS	Same as above

FLANGE FORGED (CARBON/STAINLESS STEEL/ GROOVED/ THREADED)

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CD ENGINEERING CO.	C-199, Bulandshahr Road Industrial Area, Ghaziabad -201009, India Phone : +91.120.2866315 – 17, Fax : + 91.120.2866319 Corporate e-mail : cdec@vsnl.com Mail us at: info@cdengg.com
CD INDUSTRIES (GHAZIABAD)	3, South of GT Road, BRIA, Ghaziabad – 201009, Uttar Pradesh, India Telephone No. : 0091-120-2866744, 2866369 Fax No. : 0091-120-2866743 E-Mail : info@cdind.org
CHAUDHRY HAMMER WORKS LTD.	Near Hapur Road Flyover, Maliwara Ghaziabad – 201 001, Uttar Pradesh, India Phone +91 120 4388000 Fax +91 120 4376971

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J K FORGE INDUSTRIES	122, Narayan Dhuru Street, Ground Floor, MUMBAI-400003. Phone : 2345 1284 / 2343 9210, Fax : (91-22) 2342 6901 E-mail : mailto:jkforge@hotmail.com, contact@jkforge.com
KUNJ FORGINGS	6 K. M. Mile Stone, ChapparolaDistt. GautamBudh Nagar, (U.P.), INDIA Phone : +91-120-4292692, 4292693, 4292694, +91-4292695, 4292696 Fax : +91-120-4292699. 4755888 Board : +91-120-4755900 E-mail : kunj@kunjforge.in
M S FITTINGS MFG. CO. PVT. LTD.	17, Weston St. Kolkata-700013, India Phone : +91-033-2236-2869, 2236-2902/3 Fax : +91-033-2225-2103 E-Mail : headoffice@msfittings.com
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R N GUPTA & CO. LTD.	704, 7th Floor, DLF Tower-B, Jasola New Delhi-110044. Ph: 91-11-41090575 Tete phone : 0091-161-5246900 E-mail : info@rngupta.com, works2@rngupta.com,

VENDOR NAME	ADDRESS & CONTACT DETAILS
	marketing1@rngupta.com
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GAYATRI FORGE, MUMBAI	59, Mohamed Ali Road, 2nd Floor, Mumbai - 400 003. Telefax :23443 511, 23443 495, 23465 819 Email: gayatrif@vsnl.com Email: gayatrif1@gmail.com
SINGHAL ENGINEERS, MUMBAI	292/3, Boat Hard Road, Opp. Abhyudaya Co-Op. Bank Ltd., Reay Road (East), Mumbai-400 010 Phone : +91-22-23721017 Fax : +91-22-23719518 E-mail : singhalngg@vsnl.net, manoj@snengineers.com
HAJI IRON AND STEEL WORKS, CHENNAI	Address : 25, KumbalammanKoil Street, Tondiarpet, Chennai - 600 081. Tamilnadu, India. Phone : 044 - 2595 4953. Fax : 044 - 2595 1461. Email : hajiiron@yahoo.com
STEEL TUBES INDIA	Ashtavinayak Building, Office No.303, 3rd Floor, SadanandWadi, V.P. Road, Girgaum, Mumbai-400 004, Maharashtra, India. Phone : +91 22 61432000 (30 Lines), 23895908, 23822821, 66393996 Fax : +91 22 23895906 E-mail : stindia@vsnl.com
PERFECT SERVICES LTD.	NO:28/2, JONES STREET, PARRYS, Chennai - 600001, Tamil Nadu, India Mr. PRAKASH JAIN (+917418141415) Ph: 91-44-42620678/42165052
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SAIL	IISCO House- 5TH Floor,50 Jawaharlal Nehru Road; Kolkata- 700 071 Phone – 033 2288 0970/3524; Fax- 033 2288 2355
TATA (TISCO)	TATA Steel Ltd 52 Chowringhee Road, Kolkata-700 017

VENDOR NAME	ADDRESS & CONTACT DETAILS
	Phone – 033 6550 8157/ 8166 ; 2282 2013; Fax- 033 2282 1687/ 1813
JINDAL/ JSW	6th Floor , East Wing, Raheja Tower, M.G.Road, Bangalore – 560 001 Phone – 080 25559 869-73;Fax- 080 2559 8896
VIZAG STEEL	Rastriyalspat Nigam Ltd Visakhapatnam nSteel Ltd ; Project Office Complex, Block – D, Visakhapatnam- 530 031 Phone – 0891 251 8026/ 2518446 Fax- 0891 2518460

PAINT

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BERGER	Pattanwala Glass Works, LbsMarg, Ghatkopar West, Mumbai - 400086, Chirag Nagar Phone : +(91)-22-25168355, 25167398, 25169414 Customer care : 18003458800,18001036030 Fax : +(91)-22-25166406
GRAUER & WELL (INDIA) LTD (ERSTWHILE BOMBAY PAINTS)	Akurli Road, Kandivli East Mumbai- 400101 Mobile : +(91) - 9892214311 Phone : +(91) - (22) - 66993000 Call Us : 08586970105
JENSON NICHOLSON	107 UdyogVihar Phase 4 Gurgaon 122 016, Haryana Tel: 0124 -4567777 Fax: 0124 - 4567750 E-mail: info@jnpaints.com
GODLAS NEROLAC(KANSAI NEROLAC)	NEROLAC HOUSE, Ganpatraokadammarg Lower parel, Mumbai 400 013. Customer Care No: 1800 209 2092 Phone : 022 - 24 93 4001 / 24 99 2500 Fax : 022 - 2491 943
SHALIMAR PAINTS	Shalimar Paints Limited 4th Floor, Plot No. 64, Sector 44 Gurgaon 122 003, Haryana (India) Phone: +91-124-4616600 Fax: +91-124-4616659 Email: Feedback@ShalimarPaints.co
ASIAN PAINTS	Asian Paints Limited, Asian Paints House, 6A, Shantinagar, Santacruz (E), Mumbai - 400 055,

VENDOR NAME	ADDRESS & CONTACT DETAILS
	India. Tel: 022 - 3981 8000 Fax: 022 - 3981 8888 Asian Paints Helpline : 1800 - 209 - 5678
CDC CARBOLINE	OFFICE NO-605, TOWUN CENTER 2, 6TH FLOOR, ANDHERI KURLA ROAD, SAKI NAKA, ANDHERI EAST, Mumbai - 400059, Maharashtra, India Key Personnel : MR. PRASAD MATHEW (Executive VP) Mobile : +919819271515 Phone : 91-22-27659358/28500321/322 Fax : 91-22-28500323
GRAND POLYCOATS(P) LTD	204 SidharthComplex,R.C.Dutta Road,Vadodara-390007 Phone – 0265 3064 200 / 201; Fax- 0265 2337 022 Email-marketing@grandpolycoats.com
COROMANDEL PRODORITE	3rd Flr United India Building, Sir P M Road, Fort, Mumbai – 400001 Phone: +(91)-22-22661018 Fax: +(91)-22-22620607, 84947

WELDING RODS

VENDOR NAME	ADDRESS & CONTACT DETAILS
ESAB India Ltd.	Plot No.13, 3rd Main Road, Industrial Estate, Ambattur, Chennai - 600058. Phone No.: +44 - 42281100 Fax No.: +44 – 42281150 E-mail : kayvee.bcruz@esab.co.in
Honavar Electrodes Ltd.	305-309 , 3RD floor, damjishamji industrial complex, 9, l.b.s. marg , kurla (w) , Mumbai - 400 070, india. phone : (+91 22) 2502 0317, 2502 1238 , 65008821 Fax : (+91 22) 25100048 E-mail : hel@vsnl.com , honavarelectrodes@gmail.com
AdvaniOrlekons (Ador Welding Ltd)	Ador House, 6, K. DubashMarg, Fort, Mumbai 400001 – 16. INDIA. investorservices@adorians.com +91 22 2284 2525./ 6623 9300 +91 22 2287 3083 / 2596 6562 / 2596 6062
D & H Sechron Electrodes Ltd.	5th Floor, Merchant Chambers, S.V. ThackersyMarg, 41,

VENDOR NAME	ADDRESS & CONTACT DETAILS
	New Marine Lines, Mumbai - 400 020. Tel: +91 22 2203 7663, 4042 8100 Fax: +91 22 2203 7664, 4042 8101 Email: dnhmerc@dnhsecheron.net
D & H Welding	A-204, KailashEsplande, Opp. Shreyas Cinema, L.B.S. Marg, Ghatkopar (W), Mumbai- 400 086 - Maharastra Phone : 022-25006441 E-mail : ho@dnhindia.com/tvsundaram@dnhindia.com 98202 14827
Modi Arc Electrodes Co	Modi Industries Ltd. (Electrode Section) Opp. Hotel Prasant, Turang, Angul – 759 122 (Orissa) Tel.: (06764) 233318, 329981 Fax : (06764) 233318 Email: infoangul.modiarc@groupmkm.in
GEE Limited	Plot No. E-1, Road No. 7, Wagle Industrial Estate, Thane - 400 604, Maharashtra, India. Phone : +91 22 2582 1277/0619/2620 Fax : +91 22 2582 8938 E-mail : geeho@geelimited.com
Kobe Steels	KOBE STEEL, LTD., Welding Business Marketing Dept., International Sales & Marketing Sec. Tel. +81-3-5739-6331 Fax. +81-3-5739-6960
Fusion Engineering Products (P) Ltd,	B -16, VIthPhasem, P.O. Gamaria (Jamshedpur), Dist : Seraikela - Kharsawan – 832108 Telefax : +91 - 657 – 2200713 Telephones : +91 - 657 – 6542444 Email ID : info@fusionweld.co.in

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	M/s ARTSON ENGINEERING LIMITED	B-7/11A EXTENSION SAFDARJUNG ENCLAVE NEW DELHI 110029 INDIA PH:6169224,6173162,6179583 FX:6186106 E-mail: artdel@del6.vsnl.com cvkadvekar@vahoo.com
	M/s BAKSHI CHEMPHARMA EQUIPMENTS PVT.LTD	A-45, Road No. 10, Wagle Industrial Estate Thane 400604 INDIA PH:022-2582 6615,2582 2429 FX:022-2581 0055 E-mail: bcepl@vsnl.com
	M/s ESSAR HEAVY ENGINEERING SERVICES (A UNIT OF ESSAR PROJECTS (INDIA) LTD.)	27 KM, SURAT HAZIRA ROAD HAZIRA SURAT (GUJARAT) 394270 INDIA PH:261 6681640/1661, 9925240314,9879200052 FX:261 6681666/1603 E-mail: saiprasad.Gangishetti@essar.com; Ravi.sarin@essar.com; ali.desnavi@essar.com;
	M/s FLOWLINK INDUSTRIES PVT. LTD.	141, UDYOG VIHAR PH-1 GURGAON 122016 INDIA PH:0124-2341722,4001723, 9810059555, 9810005685 FX:0124-2341723

		E-mail: nl@flowlink.com
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	M/s GANSONS LTD.	G-10 MIDC INDL.AREA HINGNA ROAD NAGPUR 440028,INDIAPH:07104-237008/236808,235524,236543, 09823256720 FX:07104-237398 E-mail: marketing@gansonsngp.co.in; gansonsltd@dataone.in
	M/s GAYATRI TANKS & VESSELS	PLOTE NO:76, ROAD 2, SECTOR-1-S(E) , CIDCO NEW PANVEL, DIST RAIGAD MAHARASTRA 410206,INDIA PH:022-27451333, FX:022-27461458 E-mail: gayatritanks@vsnl.net
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	M/s GODREJ & BOYCE MFG. CO. LTD.	PROCESS EQUIPMENT DIVISION PLANT-15, PIROJSHANAGAR VIKHROLI, MUMBAI 400079 INDIA PH:22-67964551/3/5/6, 09819702927

		FX:22-67861513/1556 E-mail: pedmktg@godrej.com; kbhide@godrej.com; nahar@godrej.com; mishram@godrej.com;
	M/s GRAND PRIX ENGINEERING PVT. LTD.	PLOT NO. 82, SECTOR 25 FARIDABAD (HARYANA) 121004 INDIA PH:0129-4097700/17/26, 4151820, 9811061949 FX:0129-4151821, 011-5560280 E-mail: akjain@grandprixfilters.com; sales@grandprixfilters.com;
	M/s INDIA TUBE MILLS & METAL INDUSTRIES LTD.	LB SHASTRI MARG, GANDHINAGAR VIKHROLI (W) MUMBAI (MAHARASHTRA) 400083,INDIA PH:22-42546000 FX:22-25784443 E-mail: itm@itmprojects.com
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	M/s KINETICS TECHNOLOGY INDIA LTD.	ANSAL TOWERS 38 NEHRU PLACE NEW DELHI 110019 INDIA PH:6211760/61/62 FX:6471984,6446871

	M/s LAXMI ENGINEERING INDUSTRIES (BHOPAL) PRIVATE LIMITED	PLOT NO.72-A&B, SECTOR-I, INDUSTRIAL AREA GOVINDPURA BHOPAL 462023 INDIA PH:0755 4033212 TO 24, 099 7700 1696, 9953168274 FX:7554251365,7554033222 E-mail: laxmi.indls@laxmieibpl.co.in; contact@laxmieibpl.co.in;
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	M/s MABEL ENGINEERS PVT. LTD.	198/2, 2ND FLOOR NVL HOUSE GARHI, EAST OF KAILASH NEW DELHI 110065 INDIA PH:26286753-56 FX:26286758 E-mail: feg@del.matherplatt.co.in
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	M/s NEWTON ENGG. & CHEMICALS LTD.	864,B-4, GIDC INDL.ESTATE MAKARPURA VADODARA (GUJARAT) 390010 INDIA PH:0265-6672661/663, 8238158181 FX:0265-6672662 E-mail: newton@newtonengg.com; maketing@newtonengg.com;

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	M/s NOVATECH PROJECTS INDIA (P) LTD.	601 PUSHPAMANGAL COMPLEX NEAR BABUBHAI PETROL PUMP MANAR PADA, THANE (W) 400601 INDIA PH:22-25478864-67, 9821079415 FX:22-25478868 E-mail: info@novatechprocess.com
	M/s ORIENTAL MANUFACTURERS PRIVATE LIMITED	P.C.C. NOTIFIED AREA NR. RANOLI RAILWAY STATION RANOLI VADODARA 391350 INDIA PH: 2652232936, 2299,1663, 09879104949 FX: 2652230171 E-mail: marketing.om@orientalindia.net
	M/s PRECISION EQUIPMENTS (CHENNAI) PVT LTD.	130, INDUSTRIAL ESTATE, PERUNGUDI CHENNAI 600096 INDIA PH:44-24961916/1460/2855/2866, Extn.136 & 146, 9841090117 FX:44-24960411,22329129 E-mail: mktg@pecpl.com
	M/s PRECISION TANKS & VESSELS	B-9&10, L.S.C. NARAINA INDL. AREA, PH-II NEW DELHI 110028 INDIA PH:5708601/5,9810156909

		FX:5708601,5708605 E-mail: arunc@del3.vsnl.net.in
	M/s PROJECT TECHNOLOGISTS PVT. LTD.	23C, GOKUL VISHWAS COLONY ALKAPURI BARODA INDIA PH:0265-330171/456,2330456 FX:0265-2330456, 2336411
	M/s R.D.ENGINEERS (INDIA) PVT. LTD.	VINCA 1 EUROKID OFFICE COMPLEX COSMOS PARK, OPP. SURAJ WATER PARK THANE (MAHARASHTRA) 400607 INDIA PH:22-41568900/21/23, 91-9004762626 FX:22-41568901 E-mail: kamlesh_d_gohil@rdengg_nashiik.com; projects@rdengg-nashik.com;
	M/s RAJ ENGG. CO.	C-94, M. I. D.C. TTC AREA, P.O. TURBHE, NAVI MUMBAI 400613 INDIA PH:022-27614395/27686720 FX:022-27614395 E-mail: rajengg@bom3.vsnl.net.in; sales@rajengineering.com
	M/s RELIABLE FABRICATING & ENGINEERING INDUSTRIES	R-225, MIDC, RABALE THANE BELAPUR ROAD NAVI MUMBAI 400701 INDIA PH:22-27602602, 9821043212 FX:22-27605504 E-mail: info@reliablefab.in
	M/s RELIANCE FABRICATIONS PVT. LTD.	C-25&26, FIRST PHASE, INDUSTRIAL AREA, ADITYA PUR, JAMSHEDPUR 832109 INDIA PH:0657-3297166, 6574624 FX:0657-238491

		E-mail: relfab@sify.com
	M/s RELIANCE FABRICATIONS PVT. LTD.	C-17, 25 & 26, IST PHASE INDUSTRIAL AREA ADITYAPUR JAMSHEDPUR, JHARKHAND 832109 INDIA PH:0657-3297166, 6574624, 9334013344 FX:0657-2383492 E-mail: relfab@sify.com; praveen@relfab.in
	M/s SHARP TANKS & STRUCTURALS PVT. LTD.	301, White Rose Apartment S.B. Marg, J. B. Nagar Mumbai 400059 INDIA PH:022-28323329 FX:022-28386523 E-mail: stspl@vsnl.com
	M/s TAS ENGINEERING CO.(P) LIMITED	A84/85, WAGLE INDL.ESTATE THANE 400604 INDIA PH:25824716/7/55988692/3 FX:55988694
	M/s TATA CHEMICALS LTD.	DIST JAMNAGAR MITHAPUR (GUJARAT) 361345 INDIA PH:02892-223290/213 FX:02892-223227 E-mail: dksundar@tatachemicals.com, rmukundan@tatachemicals.com
	M/s TITANIUM TANTALUM PRODUCTS LTD.	86/1 VENGAIVASAL MAIN ROAD GOWRIVAKKAM CHENNAI 601302 INDIA PH:044-22780211/0212/1210, 9841093934 FX:044-22780209 E-mail: sales@titonindia.com;

	M/s UNITOP ENGINEERS PVT. LTD.	78/1 GIDC INDL. ESTATE P.O. BOX 761 MAKARPURA BARODA (GUJARAT) 390010 INDIA PH:265-2642161/62 FX: 265-2638697
	M/s VIJAY TANKS & VESSELS LIMITED	NATIONAL HIGHWAY NO. 08 SANKARDA VADODARA (GUJARAT) 391350 INDIA PH:0265-2840168/171,9727769309 FX:0265-2840577 E-mail: ho@vijaytanks.com;
	M/s VIJAY TANKS & VESSELS LTD., (KANDLA)	PLOT NO. 316 - 328 D442 & E 443, SECTOR-IV KANDLA SEPECIAL ECONOMIC ZONE KANDLA GANDHIDHAM 370230 INDIA PH:2836-253805, 9924933658 E-mail: kandla@vijaytanks.com
	M/s VIPJ INDUSTRIAL ENTERPRISES PVT. LTD.	11,BROJANATH DUTTA LANE KOLKATA 12 INDIA PH:2241-4228 FX:2241-4228 E-mail: vipj@sify.com

3.0 LIST OF RECOMMENDED MAKES FOR ELECTRICAL WORKS

SL. NO.	ITEM	APPROVED MAKES
A	ELECTRICAL	
1	LV Panel/PDB	L&T/ABB/Seimens/Cosmic Power
2	Motors	ASEA BROWN BOVERI LTD. BHARAT BIJLEE LTD CROMPTON GREAVES LTD KIRLOSKAR ELECTRIC COMPANY LTD. SIEMENS LTD.
3	LOCAL CONTROL STATION	BALIGA LIGHTING EQUIPMENTS PVT LTD, FCG, SUDHIR SWITCHGEAR LIMITED,FLEXPRO ELECTRICALS PVT LTD
4	LIGHT FITTINGS & ACCESSORIES (INDUSTRIAL	BAJAJ, CROMPTON GREAVES LIMITED, WIPRO, GE, HAVELL'S INDIA LTD, PHILIPS INDIA LTD
5	Cables	Polycab, RPG CABLES LTD,UNIVERSAL CABLES LTD,HAVELL'S INDIA PVT LTD,KEI INDUSTRIES LIMITED, FINOLEX.
6	CABLE GLANDS	Comet/Polycab
7	POWER AND CONTROL TERMINALS	DOWELL,
8	CABLE TRAY PREFABRICATED	ELMEX, CONNECTWELL, THERMOPLAST, WAGO, PHOENIX,
	CONDUIT	INDIANA

4.0 LIST OF RECOMMENDED MAKES FOR PUMP

PD PUMP	M/S VARAT PUMPS & MACHINERY (P) LTD/ M/S DELTA PD PUMPS PRIVATE LIMITED/ M/S CHEMGUARD / M/S ALFA PUMPS/ PAREKH ENGINEERING COMPANY/ M/S ROTO DEL PUMPS

Note:

1. Make of any other material/equipment / components not mentioned above/BOQ/Tender document shall have to be approved by Owner / Consultant.
2. Final choice of the color and make from the above list shall be decided by the Owner / Consultant.

DELHI AVIATION FUEL FACILITY PRIVATE LIMITED

ANNEXURE II – DEVIATION SHEET

EXCEPTION AND DEVIATIONS STATEMENT				
S.NO.	PAGE NO. OF TENDER DOCUMENT	CLAUSE NO.	SUBJECT	DEVIATIONS

Bidder shall list all the deviations in the following given format only on their Letterhead. The Deviation sheet should be submitted along with technical bid.

In case no deviation sheet is submitted along with technical bid, it would be concluded that bidder has accepted all specifications, terms and conditions.

_____

Sign & Stamp of Bidder

DELHI AVIATION FUEL FACILITY PRIVATE LIMITED

ANNEXURE III – DECLARATION SHEET

Date:

DECLARATION

We, M/s hereby, unconditionally accept all terms & conditions of TENDER NO.: DAFFPL/MOD/FF/2018-19/06 (JOB: CONSTRUCTION OF SEWERAGE SYSTEM) including Scope of job, quantities, completion period, terms & condition without any deviations.

Sign & Stamp of Bidder

Note: In case of deviations (whether technical or commercial) the above declaration should not be submitted and the deviations should be mentioned separately on bidders letter head with the heading "DEVIATION SHEET". In absence of "DEVIATION SHEET", it would be concluded that bidder has submitted his offer as per tender specifications, terms & conditions. Corrections in tender booklet will not be accepted.

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Sign & Stamp of Bidder

DELHI AVIATION FUEL FACILITY PRIVATE LIMITED

ANNEXURE-IV

PROFORMA OF BANK GUARANTEE
(EARNEST MONEY DEPOSIT)
(On Non-Judicial Stamp paper for appropriate value)

BANK GUARANTEE NO. :
BANK GUARANTEE AMOUNT:
CLAIM:
(Till 120 days from date of submission of Proposal)
TENDER NO. /DATE:
JOB DESCRIPTION/
LOCATION:

Tender Security No. [*]

Name and Address of the Beneficiary: Delhi Aviation Fuel Facility (Private) Limited
Aviation Fuelling Station, Shahabad Mohammadpur, IGI Airport, New Delhi – 110 061, India

We [*name and address of the issuing bank*] have been informed that [*Name of the Interested party*] (hereinafter called the "Interested Party") is submitting a proposal for the Award of the Works in response to a Request for Proposal ("RFP") by Delhi Aviation Fuel Facility (P.) Ltd. ("DAFFPL" or 'Beneficiary") for [*Insert description of work*] ("Works"). The conditions of the RFP, which are set out in a documents entitled Request for Proposal dated [*Please insert*] require its offer to be supported by a Tender Security.

At the request of the Interested Party, we hereby irrevocably undertake to pay you without demur, the Beneficiary, any sum or sums not exceeding Rs. _____ [*Please insert*].

Upon receipt by us of your demand in writing and your written statement (in the demand) stating that:

1) The Interested Party has, without written consent of DAFFPL, withdrawn its offer after the latest time specified for its submission and before the expiry of its period of validity; or
2) The Interested Party has refused to accept the correction of errors in nits offer in accordance with the instructions to Interested parties contained in the RFP; or

_____
Sign & Stamp of Bidder

3) DAFFPL entered in to the contract with the Interested party but the Interested party has failed to deliver the **COMPOSITE BANK GUARANTEE (SECURITY DEPOSIT & PERFORMANCE**) in compliance with the Contract conditions; or

4) The Interested Party has failed to enter into the Contract within 30 (Thirty) days of being required to do so by the Tender Officer.

Any demand for payment must contain your signature(s). The demand must be received by us at this office on or before the expiry of the earliest of the following dates, when this security guarantee shall expire and shall be returned to us:

a) Date of issue of letter communicating to the Interested Party that it has not qualified for the contract or the Proposal submitted by the Interested Party is unsuccessful or the TENDER is withdrawn and/or cancelled by the Beneficiary; or

b) 7 (seven) days after the date of delivery of an acceptable performance bond complying with the Contract conditions and execution of the Contract after the award of the works to the Interested Party; or

c) 120 (One hundred twenty) days from the last date of submission of Proposal in accordance with the TENDER.

Date:

Signature:

Designation:

Name of the Branch

_____

Sign & Stamp of Bidder

DELHI AVIATION FUEL FACILITY PRIVATE LIMITED

ANNEXURE-V

PROFORMA OF COMPOSITE BANK GUARANTEE (SECURITY DEPOSIT & PERFORMANCE)

(On Non-Judicial paper of Rs. 100/-value)

To,

DAFFPL

Dear Sirs,

M/s ……..have taken tender for the work ……for DAFFPL,.

The tender Conditions of Contract provide that the Contractor shall pay a sum of Rs. …….. (Rupees ……..) as security deposit & performance guarantee in the form therein mentioned. The form of payment of security deposit & performance guarantee includes guarantee executed by Scheduled Bank at New Delhi, undertaking full responsibility to indemnify DAFFPL, in case of default. The said party …….. have approached us at and their request and in consideration of the premises we …….. having our office at …….. have agreed to give such guarantees as hereinafter mentioned.

1. We ----------hereby undertake and agree with you that if default shall be made by M/s. ----------in performing any of the terms and conditions of the tender or in payment of any money payable to Daffpl. We shall on demand pay to you, without demur, protest or requiring you to seek recourse to M/s _____, in such matter as to you may direct the said amount of Rupees ---------- ----only or such portion thereof not exceeding the said sum as you may from time to time require.
2. You will have the full liberty without reference to us and without effecting this guarantee, postpones for any time or from time to time the exercise of any of the powers and rights conferred on you under the contract with the said ---------- ----------and to enforce or to forbear from endorsing any powers of rights or by reason of time being given to the said ----------which under law relating to the sureties would but for provision have the effect of releasing us.
3. Your right to recover the said sum of Rs. ---------- (Rupees ----------) from us in manner aforesaid will not be affected or suspended by reason of the fact that any dispute or disputes have been raised by the said M/s. ----------

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Sign & Stamp of Bidder

--------and/or that any dispute or disputes are pending before any officer, tribunal or court.

4. The guarantee herein contained shall not be determined or affected by the liquidation or winding up dissolution or change of constitution or insolvency of the said ----------but shall in all respect and for all purposes be binding operative units payment of all money due to you in respect of such liabilities is paid.
5. Our liability under this guarantee is restricted to Rupees ----------our guarantee shall remain in force until ----------unless a suit or action to enforce a claim under Guarantee is filed against us within six months from ----------(which is date of expiry of guarantee) all our rights under the said guarantee shall be forfeited and we shall be relieved and discharged from all liabilities there under.
6. NOT WITHSTANDING anything hereinbefore contained our liability under this Bank Guarantee is restricted to Rupees ----------(Rupees ----------).This Bank Guarantee shall be valid up to ----------and we are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only and only if you serve upon us a written claim or demand on or before.
7. This guarantee is to be returned to us within fifteen (15) days from the date it ceases to be in force. If the guarantee is not returned to us within the date of aforementioned it shall be automatically cancelled.
8. We have power to issue this guarantee in your favour under Memorandum and Articles of Association and the undersigned has full power to do under the Power of Attorney dated ----------granted to him by the Bank.

Yours faithfully

----------Bank
By its Constituted Attorney
Signature of a person duly
Authorized to sign on behalf of the bank

_____
Sign & Stamp of Bidder

DELHI AVIATION FUEL FACILITY PRIVATE LIMITED

Annexure- VI

Form of Letter of Undertaking

[On the letterhead of the Interested Party]

Letter of Undertaking

Date:

Delhi Aviation Fuel Facility (Private) Limited
Aviation Fuelling Station, Shahabad Mohammadpur,
IGI Airport, New Delhi – 110 061, India

Re:

The undersigned Interested Party acknowledges that the TENDER issued is confidential and personal to the undersigned Interested Party and hereby undertakes and agrees as follows:

1. "**Confidential Information**" means the TENDER and everything contained therein, all documentation, data, particulars of the Works and technical or commercial information made by (or on behalf of) Delhi Aviation Fuel Facility (Private) Limited or obtained directly or indirectly from Delhi Aviation Fuel Facility (Private) Limited or its representatives by the undersigned Interested Party or which is generated by the undersigned Interested Party or any information or data that the undersigned Interested Party receives or has access to, as a result of the TENDER, as being confidential information of Delhi Aviation Fuel Facility (Private) Limited, provided that such term does not include information that (a) was publicly known or otherwise known to undersigned Interested Party prior to the time of such disclosure, (b) subsequently becomes publicly known through no act or omission by undersigned Interested Party or any person acting on its behalf.

2. The undersigned Interested Party shall maintain the confidentiality of Confidential Information in accordance with procedures adopted by the undersigned Interested Party in good faith to protect confidential information of third parties delivered to it, provided that the undersigned Interested Party may deliver or disclose Confidential Information to its authorized representatives who agree to hold confidential the Confidential Information substantially in accordance with the terms of this Undertaking.

3. The undersigned Interested Party shall not at any time whatsoever:

   (i) Disclose, in whole or in part, any Confidential Information received directly or indirectly from the Delhi Aviation Fuel Facility (P) Limited to any third party.

_____
Sign & Stamp of Bidder

(ii) Reproduce, publish, transmit, translate, modify, compile or otherwise transfer the Confidential Information.

4. In case the Proposal of the undersigned Interested Party is not accepted and immediately upon the acceptance of the Proposal of any of the other Interested Party, the undersigned Interested Party, shall:

(i) Return all Confidential Information including without limitation, all originals, copies, reproductions and summaries of Confidential Information; and

(ii) Destroy all copies of Confidential Information in its possession, power or control, which are present on magnetic media, optical disk or other storage device, in a manner that ensures that the Confidential Information is rendered unrecoverable.

5. The undersigned Interested Party shall certify to Delhi Aviation Fuel Facility (Private) Limited that it has returned or destroyed such Confidential Information to the Delhi Aviation Fuel (Private) Limited within two (2) days of such a request being made by Delhi Aviation Fuel (Private) Limited.

Name of Interested Party's

Signature **of Authorized Representative**

_____

Sign & Stamp of Bidder

DELHI AVIATION FUEL FACILITY PRIVATE LIMITED

Annexure VII

DECLARATION to be submitted along with Technical Bid

(M/s.) hereby declare / clarify that we have not been banned or delisted by any government or quasi Government agencies or Public Sector Undertakings.

Stamp & Signature of the bidder

NOTE: If a bidder has been banned by any Government or quasi Government agencies or PSUs, this fact must be clearly stated with details. If this declaration is not given along with the technical bid, the tender will be rejected as non-responsive.

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Sign & Stamp of Bidder

DAFFPL

BOQ FOR SEWAGE NETWORKING COMPRISING OF SEWAGE PIPE, SEPTIC TANK, COLLECTION PIT, INSPECTION CHAMBERS, SUPERSTRUCTURES, PUMP FOUNDATIONS etc.

Date 04.05.2018

SL. No.	DESCRIPTION OF ITEM	QTY	UNIT	UNIT RATE (Rs.)	AMOUNT (Rs.) (a)	GST %	GST AMOUNT (Rs.) (b)	TOTAL AMOUNT (Rs.) (c=a+b)
PART - I	CIVIL WORKS							
	A - EARTHWORK							
	a) The prices for all excavations are to include for removing and clearing away all shrubs, bushes, roots etc.							
	b) The prices are also to include for all leveling and ramming foundation beds, trimming of sides and bottom grading to proper level as required.							
	c) Removal and carrying shall include for all loading, unloading and handling as may be necessary and also all necessary means of transport (Mechanical or manual as required).							
	d) The prices are also to include removal of water accumulated due to subsoil seepage, rains or from any kind of sources, either by pumping or by bailing or by any suitable method like well point dewatering etc. if reqd. No extra payment shall be made for dewatering. This also includes for draining out the pumped water to nearby available drainage system.							
	e) Normally payment of earth work shall be made according to the sizes of PCC for trenches/ pits as contemplated in the working drawings. Extra due to widening or deepening of trenches / pits shall not be paid for except for the cases where water / acid proofing would be accepted as per working drawings in such case the mode of measurement shall be as per IS : 1200							
	f) Nothing extra shall be paid for sorting /screening of excavated materials to obtain good earth for filling.							
	g) Nothing extra shall be paid on account of any lift for disposal of excavated materials							
	h) Where excavation are made in excess of the depth required, the contractor shall at his own expense fill up to the desired level with lean concrete of mix 1:5:10 (1 Cement: 5 Coarse sand: 10 Graded stone aggregate 40 mm nominal size							
	i) Rate shall include Royalty, Taxes, etc., levied by the local authorities, all transportation, loading and unloading, etc., and nothing extra will be paid on this account.							
	j) Soft / loose soil also includes filled up earth / moorum.							
	k) The filling for earth / morrum or sand shall be done in layers not exceeding 20 cm in thickness (consolidated) with by Suitable means to achieve 90% dry density at Optimum Moisture Content corresponding to standard Proctor test & vibro compactor in confined spaces.							
1	Earth work in excavation by mechanical means (Hydraulic excavator) / manual means for foundations, trenches, pipelines, storm water drains etc. including setting out, clearing and grubbing, removal of debris, dewatering if required, strutting, shoring, dressing the sides, levelling of grade and ramming the bottom, stacking up to initial lead of 100 meter in all types of soil including Bitumen Roads, Concrete and boulder work including RCC floor, for all leads and lifts.	840	Cu.M					
2	Filling available excavated earth (excluding rock) under floors and foundations in layers not exceeding 20cm in depth, consolidation each deposited layer by ramming and watering for all Lift and Lead	510	Cu.M					
3	Filling in foundations, trenches ,pipelines etc. with approve quality sand in layers not exceeding 20cm in depth, consolidation each deposited layer by ramming and watering for all Lift and Lead	79	Cu.M					
4	Dispoasl of surplus earth at a owner designated place beyond initial lift of 100 M	330	Cu.M					
	CONCRETE WORK / REINFORCED CONCRETE WORK							
	a) The prices for concrete in beds and slabs are to include for laying on any type of sub grade, laying to falls, or cambers and for preparing surfaces to receive concrete.							
	b) All concrete surfaces shall be finished to a fair face to give a smooth and even surface. Nothing extra shall be paid on this account.							
	c) The prices are to include leaving pockets, cut outs and holes and to provide wooden boxes or any other suitable arrangements in RCC for bolt holes in slab, beams, walls, foundation of equipments etc. as per approved working drawing. (Nothing extra shall be paid on this account).							
	d) No deduction in RCC quantity shall be made for pockets and nothing extra shall be paid for providing pockets as mentioned in para 'C' above.							
	e) Measurement of opening in concrete work/RCC work: For measurement of openings in concrete work / RCC works, shall be as per IS: 1200 Part-III.							
	f) All pocket holes are to be properly covered by suitable means so that dirt, rain water etc. etc., should not enter the pockets/holes etc. (Nothing extra shall be paid on this account.)							
	g) Threads of bolts etc. which have already been fixed in the pockets are to be greased and polythene sheet properly covered with gunny bags to protect it from damages from all sources. (Nothing extra shall be paid on this account.)							
	h) The prices shall include for all rebating, trotting, chamfering weathering, molding etc. to accord with the details shown on the approved working drawings							
	i) Nothing extra shall be paid for any intricate concrete work for foundations of equipments and machinery (dynamic/static), RCC wall and other superstructure works or any delay in concreting in small and thin sections in PCC or RCC works.							
	j) The prices for concrete are to include for hoisting and / or lowering to any height and/or depth required and in any type of form work, packing around reinforcement where required and finishing the surfaces, to fair and even surface.							
	k) The prices shall include working up or hacking of concrete surface for providing keys for further concrete work and shall also include all plane, rebated or grooved constructional and other joints.							
	l) The design mixes of all controlled concrete of various grades shall be established by the contractor on the basis of weigh batching, at the beginning of work. In all concrete / RCC work graded coarse aggregate shall be used. Any concrete work with honey comb shall be rejected and the work has to be redone by the contractor at his own cost.							
	m) Concrete admixtures for workability if necessary, may be used in RCC if decided by Engineer-in-charge. No extra payment for mixing etc, shall be made on this account.							
	n) The prices are also to include the removal of water caused by rains/seepage etc. either pumping or by bailing out or by special means like well point dewatering etc. that may accumulate in the trenches and foundation pits etc.							
	o) The prices are to include the supply of cement by the contractor.							
	p) Anti shrinkage compound used in grouting shall not be paid separately.							
	q) Desired design mix shall be got approved from Engineer-in charge before commence of casting.							
	r) The source of supply for sand and stone chips shall be approved by DAFFPL/PMC							
	s) Approved brand of 43 grade cement shall be used for preparing design mix & cement shall be tested as per relevant IS Codes. Cement supply shall be in contractor's scope.							
	Following additional points to be noted for Ready Mix Concrete(RMC)							
	a) Any loss of material shall be contractor's responsibility.							
	b) Desired design mix shall be got approved from Engineer-in charge before Casting.							
	c) Any other taxes as levied by Govt. from time to time shall be deemed to be inclusive in the contract.							
	d) Approved brand shall be used for preparing RMC & Cement shall be tested as per relevant IS Codes. Cement supply shall be in contractor's scope.							
	e) The rate includies for using Admixtures in recommended proportions as per IS 9103 to accelerate, retard setting of concrete,improve workability without impairing strength and durability as per direction of Engineer-in-charge. Cement content in RCC shall not be less than 410 kg per Cu. M							
	Note: Besides the above mentioned points, Pl. mote that all RCC/PCC works shall be with machine mix design concrete/RMC However, In case of very small quantity, site mixing may be allowed as per discretion of Engineer In Charge, but with addition of 10% extra cement which is required for design mix							
	a) Cement brand to be used: i) Ultratech Cement ii) J.K. Cement iii) Coromandal King iv) Birla Cement ACC v) Ambuja Cement vi) Dalmia Cement vii) Top Cement							

DAFFPL

BOQ FOR SEWAGE NETWORKING COMPRISING OF SEWAGE PIPE, SEPTIC TANK, COLLECTION PIT, INSPECTION CHAMBERS, SUPERSTRUCTURES, PUMP FOUNDATIONS etc.

Date 04.05.2018

SL. No.	DESCRIPTION OF ITEM	QTY	UNIT	UNIT RATE (Rs.)	AMOUNT (Rs.) (a)	GST %	GST AMOUNT (Rs.) (b)	TOTAL AMOUNT (Rs.) (c=a+b)
	B. PLAIN CEMENT CONCRETE							
	Providing and laying Cement Concrete in foundation, footings and base for columns/walls including proportioning, mixing in mechanical mixer, laying vibration by means of mechanical vibrators, curing etc. complete including the cost of shuttering:-							
5	Concrete of mix 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	20.00	Cu.M					
6	Concrete of mix 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)	110	Cu.M					
	C. REINFORCED CEMENT CONCRETE							
	IN FOUNDATION & PLINTH:							
7	Providing and laying in position, RMC M-25 grade for reinforced cement concrete work, using cement as per approved design mix, including cost of centering, shuttering but excluding the reinforcement. including Admixtures in recommended proportions as per IS 9103 to accelerate, retard setting of concrete,improve workability without impairing strength and durability as per direction of Engineer-in-charge. Water proofing compound, if used, shall not be paid separately. (Note :- Cement content considered in this item is @410 kg/cum.)	30	Cu.M					
	IN SUPERSTRUCTURE:							
8	Providing and laying in position, machine batched, machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, including floors. Floors are to be cast in the panel of max 3meter x 3meter including integral smooth finish and painting side surfaces with two coats of bitumen paint of approved quality, complete in all respects as per direction of Engineer-in-Charge, using cement as per approved design mix, including pumping of concrete to site of laying and cost of centering, shuttering but excluding the reinforcement. including Admixtures in recommended proportions as per IS 9103 to accelerate, retard setting of concrete,improve workability without impairing strength and durability as per direction of Engineer-in-charge. (Note :- Cement content considered in this item is @410 kg/cum.)	14	Cu.M					
	REINFORCEMENT & EMBEDMENTS							
	a) Wastage in cutting will not be paid for. Only steel actually fixed in position will be paid by the linear measurement i/c hooks, chairs, dowels and laps. Only authorized hooks and laps approved in bar bending schedule shall be paid. Lapping of bars will be allowed only where the required bar length exceeds the standard lengths available. All other laps provided unless otherwise specified in the drawings shall not be measured and paid for. Weight of binding wire shall not be measured for payment. The prices are to include for the supply of all Reinforcement & Embedment at site by the Contractor.							
	b) Reinforcement are to be tack welded in addition to binding by 18 SWG annealed wire wherever necessary to impart fixity. Bars of 28 mm dia & above shall also be provided with stitch weld in additions to binding with annealed iron wire and nothing extra will be paid for stitch welding. Stitch welding shall be done as per IS specifications. No extra claim shall be entertained on this account.							
	c) Rebars to be used: i) TISCO ii) SAIL iii) RINL(VIZAG STEEL) iv) ESSAR v) JINDAL STEEL AND POWER							
9	Supplying, cutting, bending, hoisting, placing in position with proper precast concrete block cover and binding with 18 SWG annealed wire, high yield strength deformed bars as per IS: 1786 for all R.C.C works including all necessary handling at all heights and depths complete in all respects and as per direction of the Engineer-in-Charge. Thermo Mechanically Treated Bars Fe- 500 grade,Conforming to IS1786	4.50	Te.					
	FINISHING							
	a) The prices are to include for work at any height / depth and for all necessary scaffolding etc. as required.							
	b) The prices shall also include for making to form key for plaster and for all work in narrow width formed angles, chamfered external angles and for making good the faces.							
	c) Plastering shall be measured in sq. metre area of the surface to be plastered, as per IS: 1200 (Part XII). The rate shall include erecting and removal of scaffolding all labour, all materials, equipment, plants, tools and all incidental expenses to complete plastering, pointing, rubbing out joints, cleaning, wetting, filling with cement mortar, troweling etc. and making of drip moulds, grooves, vattas, bands etc. including curing.							
	d) The prices are to include the supply of cement at site by the contractor.							
	e) Water proofing compound in proportion recommended by manufactures shall be used in all Plaster works for which no separate payment will be done.							
	f) Sand used for plastering shall be from approved sources.							
10	Providing and laying cement plaster on surfaces with Coarse sand including curing etc.							
i)	12 mm Cement plaster of mix1:4 (1 cement: 4 coarse sand)	66	Sq.M					
11	Providing & Placing in position suitable PVC water stops conforming to IS:12200 for construction/ expansion joints between two RCC members and fixed to the reinforcement with binding wire before pouring concrete etc.complete, serrated with central bulb (225mm wide, 8-11mm thick)	14	RM					
12	Demolishing R.C.C. work manually/by mechanical means including stacking of steel bars & disposal of unserviceable material outside site at unobjectionable place& as per direction of Engineer-in-charge.	4	Cu.M					
13	Demolishing Brick work manually/mechanical means including stacking of serviceable material & disposal of unserviceable material outside site at unobjectionable place & as/direction of Engineer-in-charge.	1	Cu.M					
14	Dismantling Steel work in single sections including dismembering and stacking within premises R.S Joists	10	KG.					
	SANITARY							
15	Providing and laying 160 mm dia nominal bore High Density Polymer (HDPE) pipe as per IS:4984, PE-80 grade, pressure rating PN 6 (6 bars) including all fittings and jointing, complete as per directions of Engineer in Charge.	1,000	RM					
i)	Same as above, but with PE-63 material and pressure rating PN2.5.	50.00	RM					
ii)	Same as above but in vent pipes. The cost of fixing straps is included	10.00	RM					
16	Providing and fixing HDPE gate valve with SS Lever of approved Brand : 160 mm nominal bore ,	4.00	Each					
17	Pumps : 2 sets of 1W + 1S Screw Pump with 500 RPM motor drive with Discharge pressure & Pressure relief valve set pressure of 3 Bar and Capacity of 15 Cu M / Hr alongwith mechanical seal and 3.7 KW prime mover - completete set . MOC: Pump rotor and shaft - SS 316, Stator- Nitrile black, Housing- CI	4.00	Each					
18	Providing and fixing HDPE non return valve of approved quality : 160 mm nominal bore, horizontal bore, Pressure Class 120 . (NRV on pump discharge side between pump and gate valve)	2.00	Each					
19	Providing and fixing S.S. Strainers in SS Framing in partition wall (50 mm x 50 mm mesh) with size 2000 mm x 500 mm of SS 316.	2.00	Each					
20	Providing and fixing square-mouth S.W. gully trap class SP-1 complete with C.I. grating brick masonry chamber with water tight C.I.cover with frame of 300 x300 mm size(inside) the weight of cover to be not less than 4.50 kg and frame to be not less than 2.70 kg as per standard design :	6.00	Each					
i)	180x150 mm size P type with common burnt clay bricks of classDesignation 75	1.00	Each					
ii)	150x100 mm size P type with common burnt clay bricks of class Designation 75	2.00	Each					
21	Supply, Installation and Painting of G.I. pipes & fittings with synthetic enamel white paint over a ready mixed priming coat, both of approved quality for new work : 15 mm diameter pipe	5.00	RM					

DAFFPL

BOQ FOR SEWAGE NETWORKING COMPRISING OF SEWAGE PIPE, SEPTIC TANK, COLLECTION PIT, INSPECTION CHAMBERS, SUPERSTRUCTURES, PUMP FOUNDATIONS etc.

Date 04.05.2018

SL. No.	DESCRIPTION OF ITEM	QTY	UNIT	UNIT RATE (Rs.)	AMOUNT (Rs.) (a)	GST %	GST AMOUNT (Rs.) (b)	TOTAL AMOUNT (Rs.) (c=a+b)
22	Constructing brick masonry chamber for underground C.I. inspection chamber and bends with 75 class designation bricks in cement mortar 1:4 (1 cement : 4 coarse sand) C.I. cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover with frame to be not less than 38 kg (weight of cover 23 kg and weight of frame 15 kg) R.C.C. top slab with 1:2:4 mix (1 cement :2 coarse sand : 4 graded stone aggregate 20 mm nominal size) foundation concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete as per standard design :							
23	Inside dimensions 600x 850 mm and 45 cm deep for pipeline with3 or more inlets, with common burnt clay bricks of class designation 75	1.00	Each					
24	Providing, transporting and fixing in position PreCast Planks with RCC M30 as per approved drawing at any heights and levels, all complete.	1.00	CuM					
25	Providing and fixing MS rungs in RCC Walls as per approved drawings and/or as directed by Engineer in Charge	50.00	KG.					
26	Providing and fixing Insert plate along with Bars, welded to steel, all complete as per directions of Engineer in Charge	75.00	KG.					
27	Steel channel or members for supporting and framing works (Unit Rate only)	0.50	Te					
	MISCELLANEOUS							
	BRICK MASONARY							
	All brick work shall be with Burnt clay Brick class designation 75 as per CPWD Specification unless otherwise mentioned. The rate includes for special jambs, sill and corners and other scaffolding, curing etc. including all labour and materials							
28	Brick work with Class Designation 75 bricks in Cement mortar 1:4 (1 cement : 4 coarse sand) in Foundation Works. The rate includes	22	Cu.M					
29	Providing and laying cement plaster on surfaces with Coarse sand including curing etc.							
i)	12 mm Cement plaster of mix1:4 (1 cement: 4 coarse sand)	62	Sq.M					
30	Providing, fabricating, preparation of fabrication drgs.with approval from client and fixing in position structural steel work (yield stress 250 N/mm2) conforming to IS 2062 as per specifications/drawing/engineer-in-charge, using Rolled steel sections, flats, rods, bolts, square bars, insert plates, Baseplate in foundation with holdfast,round / rectangular tubes, etc., including cutting, bending, grinding, threading, bolting, welding, etc., by doing surface finishing by near white sand blasting cleaning as per SSPC SP 10 note 1 with primer coat of inorganic zinc silicate self cured with DFT 50-75 µm, mid coat of high build polyamide epoxy with DFT 75-100 µm and finish coat of acrylic aliphatic polyurethene with DFT 50-75 µm as per the drawing and specifications complete and as directed by Engineer-in-Charge.	3	MT					
31	Providing, fabricating and fixing 16 mm dia. anchor bolts of required grade in position at required location to correct line and levels in pedestals, columns, floors, machine foundations, trenches including necessary fittings, welding etc. all works complete as per specifications, drawings & as directed by Engineer-in-Charge	160.00	KG.					
32	i) Providing & fixing Klippon Galvalume steel profile sheets (size, shape and pitch of corrugation as approved by Engineer-in-charge) of bare metal thickness 0.50mm as per ASTM A446 having yield stress of 275mpa, surface shall have hot dip metallic coating of Aluminium Zinc alloy comprising of 55% aluminium,43.5% zinc & 1.5% silicon, with 5-7 micron epoxy primer and polyester top coat of 15-18 micron on both sides,total coated thickness(TCT) of 0.58mm.Sheet shall have protective guard film of 25 microns minimum to avoid scratches while transportation & should be supplied in single length up to 6m or as desired by Engineer-in-charge.	29	Sq.m					
	ii) Same as above but in Profile Sheet for roofing ridge	9	Mtr.					
PART - 2	ELECTRICAL WORKS							
33	**LV Panel**							
	Supply, installation , testing and commissioning of Weather Proof 32A, 415V, 3Ph & N, 50HZ , IP55,sheet steel enclosure floor/wall mounted LV panel suitable for cable sizes mentioned in drawings/documents having following incoming and outgoing feeders . 1no.-Incomer 32A MCB . 2Nos DOL starter for 3.7kw Motor with protection fuses,single phase preventer and Contactor . The starter will have voltage and current meters with ON and OFF Push Buttons on the Door of the Panel. 2Nos 6A TPN MCB & 2 Nos 6A SPN MCB	2	Nos					
34	PDB (Power Distribution Board)							
	Supply , installation , testing and commissioning of weather proof 63A, 415V, 3Ph & N, 50HZ , IP55, sheet steel enclosure (flush mounting to wall) power distribuition board suitable for cable sizes mentioned in drawings/documents having following incoming and outgoing feeders i) 1no.-Incomer 63A, TPN MCB with ELCB (30mA Sensitivity). ii) 4nos.-O/G 32A, TPN MCB.	1	Nos					
35	**LIGHTING FIXTURES & ACCESSORIES**							
	Supply and Installation of WP 36W LED well glass type lighting fixture with toughened glass and mesh suitable for LED lamp with integral type control gear box . Lighting fixtures shall be provided with required no. of single compression nickle plated brass cable glands and stopping plug.	4	Nos					
36	PERFORATED TRAY & CONDUIT							
36.1	Suply, Installation, laying, fixing of 100mm perforated tray	30	Mtr					
36.2	Supply, Laying & fixing of 25 mm Dia PVC flexible conduit of min. 2mm thick of wall heavy duty type & as per latest IS.	10	Mtr					
37	Supply, Laying & Termination of 1.1 kV) grade, stranded Cu / Al. Conductor, XLPE insulated, PVC inner sheath, steel / wire armoured, PVC outer sheath LV power cables.of following sizes on cable trays, supported on steel structures, burried in ground minimum 600mm deep including excavation, back filling, sand & bricks and / or to pull-through pipes. The rate shall include supply & fixing of strip number tags, fixing of saddles and saddle bars, fixing of route markers, protective tiles etc. including all labour and materials, as per directions of Engineer-in- charge. Before procurring the cable, Contractor to check the length of cable as per site conditions and get approved by Engineer-in charge							
37.1	3CX2.5 sq mm Cu (For Lighting)	30	Mtr					
37.2	2C x 2.5 sq mm Cu (For Starter to Water level Controller)	30	Mtr					
37.3	3C x 4 sq mm Cu (For Starter to Motors)	20	Mtr					
37.4	3.5C x 95 sq mm Al (Incoming to PDB)	175	Mtr					
37.5	3.5C x 50 sq mm Al (For Collection Pit LV Panel)	200	Mtr					
37.6	4C x 16 sq mm Al (For Septic tank LV panel, DB etc)	165	Mtr					
38	Supply, Installation and testing of GI earth strip / laying of earthing cable of following sizes directly buried under ground at depth of 500 mm, including handling, transportation to erection site , bending, straightening, cutting to size, welding together of earth strips in overlapping manner, chipping in concrete floors/ paved areas for laying the earth strips under floors/ paved areas and making good by cement plastering concrete after laying of the strips ; clamping and supporting of earth strips laid above ground, connecting the strips/ wire at both ends to equipment or to earth bus / earth plates or to GI brackets fixed inside earthpit chamber, by bolting etc., Hessian tapes, all necessary lugs, GI hardware, GI clamps, nut-bolts, screws, civil masonry materials, etc. all work, labour as per attached specifications of this tender and directions of owner/consultant. Rate of excavation and back filling of GI strip/earthing cable is included. Before procurring the earthing material, Contractor to check the length/requirement as per site conditions and get approved by Engineer-in charge.							
38.1	50 x 6 mm GI Strip	75	MTR					
38.2	25 x 6 mm GI Strip	40	Mtr					
38.3	No 8 SWG solid GI wire	40	Mtr					
38.4	Supply ,and Installation of GI Earth Bus bars (size: 200x50 x12mm thick)	2	Nos					
38.5	CAD Weld Branch Connection	4	Nos					
39	EARTHING PITS							
	Supply, installation, testing & commissioning of Maintenance free earth pits with an earth electrode 14 mm dia 3 meter long MS rod with 250 micron copper electrolytic coating and UL listed. The earth pit shall be duly treated with minimum 20 Kg of earth enhancing compound complete with heavy duty plastic pit cover, connector, Cu Clamps including all required accessories and indicator plate. Earth rod and interconnecting strip shall be exothermically welded.	4	Nos					
40	Supply and Installation of Water Level Controller							

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Date 04.05.2018

SL. No.	DESCRIPTION OF ITEM	QTY	UNIT	UNIT RATE (Rs.)	AMOUNT (Rs.) (a)	GST %	GST AMOUNT (Rs.) (b)	TOTAL AMOUNT (Rs.) (c=a+b)
	Dual Motor Model Level Controller for (415V AC) Three Phase Pumpset Starter of MV Instruments or equivalent with 4 Pair CAT 5e Communication cable minimum 20 mtrs/as required, Multi strand 1.5 Sq.mm. Copper Power cable minimum 10 mtrs/as required, 02 nos required length of 3/4th or 1 inch dia. PVC Electrical Pipe for sensor arrangement in the tanks including insulation Tape, necessary screws and wooden gattas pieces etc for mounting controller unit.	2	Nos					
41	**Cable termination**							
	Cable termination with Industrial Glands and lugs Supply & carrying out end termination of followin AL/ CU conductor, XLPE insulated galvanised steel/wire armored, extruded PVC outer sheathed cable using Double compression Weatherproof IP55 cable glands and lugs (including striping of cable insulation, crimping the lug on to the conductor, restoration of the insulation, clamping of cable cores, & earthing of armour including all labour & materials as per directions of Engineer In charge.							
41.1	2C x 2.5 sq mm Cu	8	Nos					
41.2	3C x 4 sq mm Cu	8	Nos					
41.3	3.5C x 95 sq mm Al	2	Nos					
41.4	3.5C x 50 sq mm Al	2	Nos					
41.5	4C x 16 sq mm Al	6	Nos					
	TOTAL							

Total Amount (A) including taxes in words:

Notes:

1. All supply and work shall be in line withtender specifications, drawings and instructions of the Engineer-in-Charge.
2. Construction power, water, loading and boarding, Site Storage with watch and ward, receipt, unloading, shifting material to store and internal shifting to site shall be included in Vendor's scope.
3. The unit rates as quoted to arrive at above total price shall be firm and inclusive of all duties, levies, transportation etc. No separate payment shall be made for site mobilization / demobilization, insurance etc.
4. The Schedule of Rates should be read with all other sections of the tender documents.
5. The tenderer shall be deemed to have studied the drawings, specifications and the details of work to be done within the time schedule and to have acquainted with the conditions prevailing at site. Site visit is mandatory.
6. The quantities shown against the various items are only indicative of the quantum of work and it may vary to any extent. Billing will be done as per actual.
7. Vendor to make measurements at site before dispatch of any material.
8. The rate quoted shall be inclusive of all work as mentioned in the scope of work in tender documents.
9. In case of any rework due to faulty workmanship or any defects occur or modifications are required no extra claims for such works/supply shall be entertained.

Signature of Bidder along with company seal